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A HISTOLOGIC STUDY OF THE GUM IN PYORRHEA*

By T. D. BECKWITH, Ph.D., F. V. SIMONTON, D.D.S., and ADRIENNE WILLIAMS, M.A., San Francisco, California

THE cause of pyorrhea remains thus far unidentified, although a great variety of efforts have been made to determine it specifically. Certain authorities believe that its etiology lies in some more generalized condition of the physiologic being. This school of thought is typified, for example, by the belief of Hopewell-Smith,[1] who considers that the initial lesion appears as a decalcification and rarefaction of the alveolar process, resulting in a definite loss of osseous tissue adjacent to the tooth surface. Howe[2] contends that at least one major factor leading to the breaking down of the periodontal fibers is to be found in diet deficiency, since inoculation alone was insufficient to produce a characteristic lesion. Positive results were attained through diet changes experimentally. Other writers, Goadby,[3] Eyre and Payne[4]

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*From the Department of Bacteriology, University of California, Berkeley, University of California Dental School, San Francisco, and California Stomatological Research Group.

1. Hopewell-Smith, A.: The Normal and Pathological Histology of the Mouth, Philadelphia, P. Blakiston's Son & Company, 1918.

2. Howe, P. R.: Further Studies of the Effect of Diet Upon the Teeth and Bones, J.A.D.A., 10:201 (March) 1923; Some Experimental Effects of Deficient Diets, Dent. Summary, 44:212 (March) 1924.

3. Goadby, K. G.: A Preliminary Note on the Treatment of Alveolar Osteitis (Rigg's Disease) by Means of Vaccine, Brit. M.J., 2: 562-567, 1905.

4. Eyre, J. W., and Payne, J. L.: Some Observations on the Bacteriology of Pyorrhea Alveolaris and the Treatment of the Disease by Bacterial Vaccines, Proc. Roy. Soc. Med., Odontol., 3: 29-46, 1910.

and Kritchevsky and Séguin,[5] consider that the causative factor of this disease entity is bacterial and thus implicate many different forms including the three morphologic types, rods, spirals and cocci. Another group places emphasis on the protozoan fauna of the mouth. On the other hand, and in contradistinction to the authors just mentioned, there are many—among whom may be mentioned Merritt,[6] Lescohier[7] and Brown[8]—who are of the belief that, at present, there is not sufficient evidence available to warrant the decision that the etiology of the disease is to be ascribed to any known micro-organism. One is probably correct, however, in feeling that, in pyorrhea, early changes are to be found within the confines of the gingiva, since, from it, there is a perfectly logical path for extension into the periodontal membrane by invading organisms, whether primary or secondary.

There are many reasons why it appears to be advisable to make a survey of gingival conditions in pyorrhea. If the inception of the process lies in this area, as seems probable, it is of paramount importance. It is the belief of certain authors, as represented by Znamensky,[9] by Endelman and Wagner[10] and by Talbot[11], that the beginning may be found in the areas adjacent to the subgingival sulcus. In this connection, let us consider the various factors that may allow infection to gain entrance more easily to this area, even though we are not warranted as yet in ascribing the source of pyorrhea alveolaris to any primary infectious agent. It has been claimed that there are certain mechanical weaknesses here; that the contour of the gingival margin is such that impaction of food material and detritus between the epithelial surface and the enamel of the tooth may easily occur; that the line of attachment between these two tissues does not appear to be strong when examined carefully microscopically, and that the epithelial covering becomes thin as it approaches the cemento-enamel junction, with the result that less protective covering is present for the underlying connective tissue fibers. Hartzell[12] also states that the line of union always is structurally deficient from the moment of eruption of the tooth. Box[13] emphasizes this likewise. Reasoning from such a basis, traumatic injury with a resultant path of infection for some microbial form may be conceived as easily occurring. Agency for such trauma is readily supplied by a toothpick, or might be due to the pressure of impacted food, particularly if it is there because of malocclusion or excess movement of the tooth within its socket; or to the presence of deposits of dental calculus. That impacted material will act, from the point of view of the physicist, as a wedge, and thus may bring about progressive injury, is stressed by

5. Kritchevsky, B., and Séguin, P.: Local and General Spirochaetosis, Dent. Cosmos, 63: 888-892, 1921.

6. Merritt, A. H.: The Irrationality of Bacterial Vaccines in the Treatment of Pyorrhea Alveolaris, Dent. Cosmos, 58: 62-69, 1916.

7. Lescohier, A. W.: Bacterial Findings and Their Relationship to Pyorrhea Alveolaris and Interstitial Gingivitis, J.A.M.A., 68: 414-416, 1917.

8. Brown, C. P., The Bacteriology of Pyorrhea Alveolaris, New York M.J., 98: 1201-1205, 1913.

9. Znamensky, N. N.: The Pathology and Treatment of Periodontal Disease (Pyorrhea Alveolaris), 17th Internat. Cong. Med., Sect. XVII, Stomatology, 1913, pp. 17-34.

10. Endelman, J., and Wagner, A. F.: General and Dental Pathology, St. Louis, C. V. Mosby & Company, 392.

11. Talbot, E. S.: Interstitial Gingivitis or So-Called Pyorrhea Alveolaris, Philadelphia, S. S. White Dental Mfg. Co. 1899.

12. Hartzell, T. B.: Some Evidence of the Importance of the Dental Path as a Source of Serious Localized and Generalized Infections, J.N.D.A., 3: 172-185 (May) 1916.

13. Box, H. K.: The Evolution of the Periodontal Pus-Pocket, J.N.D.A., 8: 599-608 (Aug.) 1921.

Hartzell and Henrici.[14] Irritation may follow from a number of possible causes. It may be produced by subgingival (annular) calculus, as a foreign material lying in close contact with the tissues. Food débris may be acted on both by enzymes of the oral cavity and by the bacterial flora there present in great quantity; and it is conceivable that these two classes of agencies may act together. As a result of the chemical changes thus induced, cleavage products of toxic or irritating nature may be evolved. This has been discussed in its more general aspects by Vaughan.[15] Undoubtedly, these products are flushed out from this area by saliva, but nevertheless there must remain a positive, even though slight, concentration of such substances. By erosion, mechanically or by solution chemically, possibly by interruption of evaporation by contact or by combination of any of these factors, the epithelial protective coating adjacent to the tooth becomes thinner, as will be discussed later. We know that the cellular structures in the papillae of the submucosa are highly vascular and that the blood vessels extend to their tips. Of necessity, then, loss of epithelium while this particular condition persists is attended by increasing danger of exposure of the papillae, with attendant hemorrhage, which thus offers a direct channel of infection to the various circulatory channels there present. It will be noted that this discussion ignores entirely all possible factors of local or general immunity that may be involved but concerning which our knowledge at present is incomplete, particularly so far as it pertains to the gingivae. In addition, it must not be forgotten that the submucosa is composed of loosely placed and bound bundles of connective tissue that offer, mechanically, relatively unobstructed paths for an infectious agent when access is once gained through loss of epithelium or by its rupture. For the reasons noted above, and even though some may be hypothetical, it was deemed of sufficient importance to make the following study in order that further insight might possibly be obtained regarding the sequence of conditions found in the gums of pyorrhea patients.

Nearly all of the specimens examined in this work have been obtained from inmates at San Quentin Penitentiary, San Quentin, California. Previous diagnosis of pyorrhea had been made by periodontists of our staff. The operative procedures necessary to obtain the tissues at biopsy have been carried out by one of us (F.V.S.) and W. Fleming and L. B. Shone. The histologic examinations have been carried through by one of us (A.W.). We have all aided in the interpretations.

All specimens of tissue have been fixed in Zenker's fluid, and nearly all have been placed in this fixative immediately after excision. The remaining few were immersed in 4 per cent formaldehyd (actual), at once and then transferred to Zenker's shortly afterward. Sections were cut from paraffin embedded blocks and these ordinarily were prepared at 6 microns. It will be realized at once that the usual hematoxylin-eosin staining is insufficient for the more detailed points in examination, and thus various methods of staining and precipitation were utilized for special purposes. Hematoxylin and eosin furnished the most satisfactory general background and such stains were used first for each block. In addition, iron hematoxylin allows more careful differentiation of nuclear structures. Van Giesen's stain with hematoxylin, acid fuchsin and picric acid is especially valuable for determining the morphology and condition of connective tissues and for differentiating white fibrous and elastic elements. Levaditi's method of precipitating and oxidizing

14. Hartzell, T. B., and Henrici, A. T.: The Dental Path; Its Importance as an Avenue of Infection, St. Paul M.J., 18: 77-86, 1916.

15. Vaughan, V. C.: Protein Split Products, Philadelphia, Lea & Febiger, 1913.

silver on and in tissue reveals many items that cannot be seen otherwise. These include the presence of certain spiral formed organisms, and certain intracellular and extra-nuclear degenerative changes in cell structures, which are likely to confuse one unless they are interpreted with care and conservatism, since they may readily be mistaken for organisms in cytoplasm. However, by this method of preparation, certain artefacts simulating spiral organisms in tissue are indicated, but these are, in fact, peculiar forms made up of disintegrating connective tissue fibers. We are convinced, therefore, that Levaditi's technic is of decided value for showing steps in disintegration in cytoplasm, as well as for demonstration of bacteria.

Efforts have been made to demonstrate micro-organisms when present in our material. Demonstration of these bacterial forms is relatively simple if they be gram-positive, for then Gram-Weigert staining with anilin violet and lithium carmin is most valuable. The greater difficulties lie in attempts to reveal the gram-negative forms, since these are much more difficult to differentiate from nuclear material of the host. For this purpose, we have availed ourselves of Nicolle's method, wherein thionin, carefully seasoned, is used with eosin as a counter stain. We attempted to make use of Manson's polychromed methylene blue, as described by Schmorl,[16] but the results were not satisfactory. Goodpasture's stain, also, while of proved value in studying lung tissue, did not come up to our expectations when used with gingival sections. It is possible that our fixation procedures were not those best suited for it.

Finally, when proper observations had been made, vernier readings were made of the best and most representative fields on the various slides, for later reference. The photographic records were prepared with the usual photographic apparatus. Color screens, together with orthochromatic or panchromatic plates, were used, in order to emphasize or to suppress certain features for the particular purpose in view. This technic proved to be very satisfactory.

The purpose of this study, then, has been to trace, if possible, the events leading to disintegration of gingival tissue in what is most likely to be considered by some as gingivitis, but which may progress to a pathologic condition of the periodontal membrane with destruction of the bony process; that is, pyorrhea as usually conceived. It is highly desirable, also, that we learn more regarding the micro-organisms which may be present in this process, even though they may be interpreted merely as secondary invaders or possibly even as saprophytes. This we have endeavored to do by histologic examinations.

Naturally, our first concern was to obtain material to be classified as normal, since the normal characteristics must be established if deviations from them are to be recognized. To our surprise, we found it difficult to procure tissues that, throughout, might be interpreted as normal. Lesions were very likely to be discernible in the area adjacent to the tooth; that is, in the gingival crevice, at least. Another point of note lies in the fact that great alterations between what are probably normal areas and pathologic portions may appear within, relatively, a microscopic distance, such as a small fraction of a millimeter. After a very considerable amount of study and search, however, we have selected the specimens that are shown in Figures 1 and 2 as being unaltered by pathologic change. Figure 1 shows tissue from a man of 35 years, the tissue being removed very shortly after death. A casual dental examination previously had indicated normal gums macroscopically. This particular section, for purposes of orientation, may be described as lying on the lingual side of the upper right lateral

16. Schmorl, G.: Die pathologisch-histologischen Untersuchungsmethoden, Leipzig. Vogel, 1909.

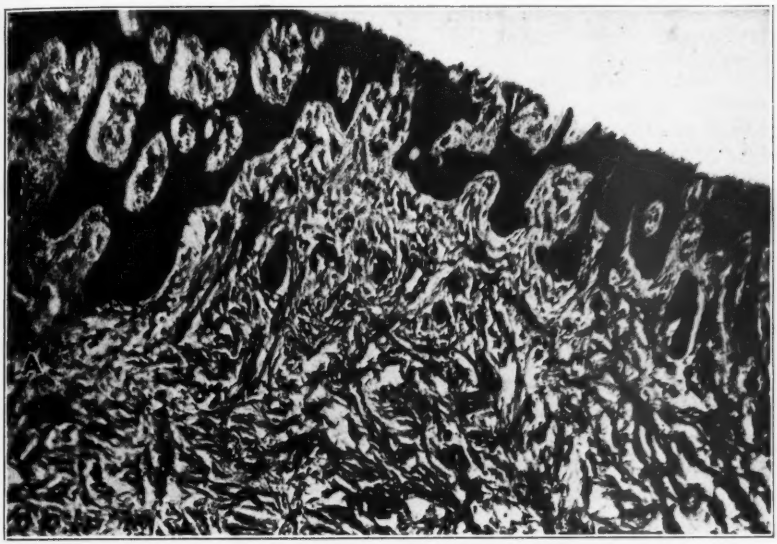

Fig. 1.—Normal gingival tissue; *A*, area of lymphocytes.

Fig. 2.—Normal gingival tissue; *A*, area of lymphocytes.

incisor. The plane of the section lies parallel to the palate and is therefore labiolingual. The surface of this subgingival epithelium is lacking as a result of a slight lack of care in necropsy procedure. Figure 2 shows tissue taken from a Chinaman of 47 years, from a portion of gum which appeared normal, although the tooth adjacent to it showed a pyorrheal pocket. This area here shown lies immediately labial to the lower right cuspid. Its plane is horizontal, labiolingual.

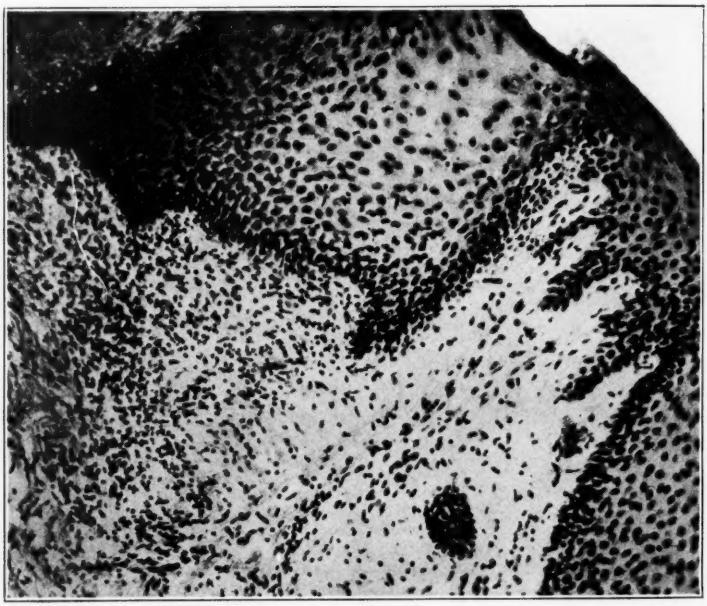

Fig. 3.—Early lymphocytic infiltration subjacent to epithelium.

In these supposedly normal areas, which were prepared with hematoxylin-eosin stain, certain points of interest should be mentioned. The epithelium covers the submucosa and the latter has many finger-like extensions, known as the papillae. The papilla is highly vascular. When healthy, this epithelial covering stains nearly evenly, although showing the usual differentiation between nuclear and cytoplasmic elements. The submucosa is made up of an interwoven network of bundles of white fibrous connective tissue. These vary in direction and thus accommodate the tissue readily to stresses and strains from any angle. They are arranged very loosely, as is shown by the lower power magnification in Figure 1. One is able to comprehend readily, therefore, the statement made by Hartzell and Henrici[14] that, when oxygen is introduced by means of a short needle with gentle pressure below the gingival crevice, the tissues will puff out over an area circumscribed by a diameter of 1½ inches. This open character of the submucosa allows ready mechanical passage for invading organisms or for toxic solutions. The submucosa is very well supplied with blood vessels, capillaries and lymph spaces, and these are

more numerous in the deeper portions of the structure. Figure 2, of higher magnification than Figure 1, shows much more clearly the character of the fibers. It has been stated that relatively small nests of lymphocytes, as shown in Figure 2 at *A*, are not abnormal. It is conceivable that they are present as a response to small amounts of possibility that these very small and seemingly insignificant islands of lymphocytes are the initial stages of an inflammatory process that ultimately would progress much farther if the source of irritation remained uninterruptedly present.

In Figure 3, there is shown what may be interpreted as an early condition

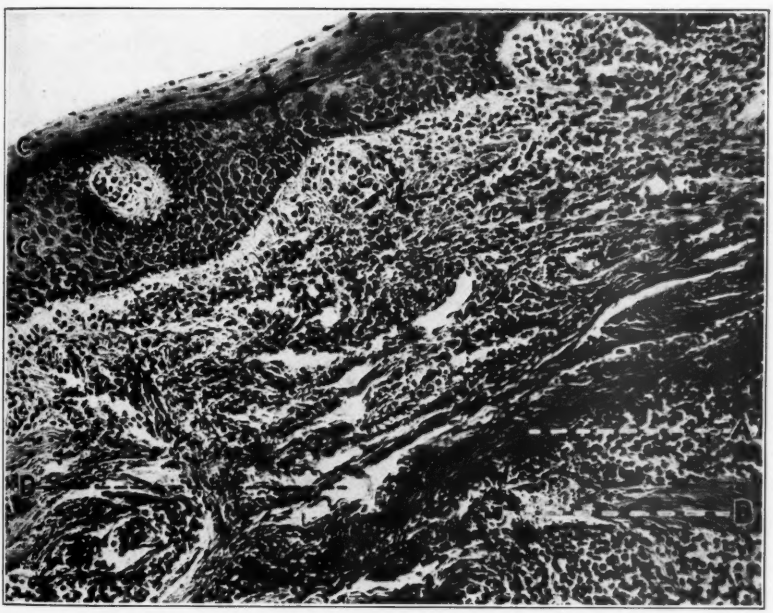

Fig. 4.—Infiltration in submucosa following connective tissue bundles at *A; B*, engorged blood vessel; *C*, leukocytes invading epithelium; *D*, destroyed tissue.

of toxic material which have seeped through from fermenting food material in the gum crevice, or that the slight trauma from the friction of a toothbrush may be sufficient to bring about this relatively slight migration. Another, still smaller area of such infiltration will be seen close beside the basement membrane, at the point of deepest infolding of the epithelium, shown on Figure 1. It must not be forgotten, however, that it is entirely within the limits of the sequence. This specimen was removed from the gum at the labial aspect of the upper right cuspid tooth of a young woman, aged 26 years, and the orientation of the section may be clarified by stating that it is labiolingual, at right angles to the main axis of the tooth. Infiltration is commencing. The major portion of the invading cells is made up of lymphocytes, although there are a large number of plasma cells with their eccentrically placed and "cart wheel" nuclei.

Polymorphonuclear leukocytes are relatively few, but the ratio of their incidence is somewhat higher at the periphery of the inflammatory area, where activity is more recent, than at its center. Some mast cells are also present, but eosinophils are almost totally absent. Edema is not marked. Migration of lymphocytes in the epithelium through the basement membrane is commencing. No hemorrhage is as yet visible. As has been suggested by Hatton,[17] the infiltration is perivascular. We were able to find no micro-organisms either by Gram-Weigert or by carbol-thionin stain. Levaditi's technic yielded inconclusive results. It will be noted that the lesion is subjacent to the bases of the connective tissue papillae rather than in the papillae, and indeed it may be said that this is the location where we have observed nearly all of these stages which, it appears to us, should be classified as early. Rarely have we noticed them in the papillae. Their incidence in this location thus coincides with the area of greatest vascularity.

In Figure 4, we have a very considerable extension of the process. This material was removed from the gum at the labial aspect of the lower right lateral incisor tooth of a man of 47 years, who showed a very evident pyorrheal condition, although the inflammation in the tissue about this particular tooth was less intense than in other areas. Inflammation was evident, but the tooth was neither loose nor extruded. The section was cut in the labiolingual position and is horizontal. The stain is hematoxylin and eosin. The combination of photographic plate and screen was such that the purples were somewhat exaggerated.

The picture is one of an advanced but subacute inflammation. The infiltering cell is the lymphocyte, with many plasma cells interspersed, together with some basophils. Edema has progressed to the point where considerable disruption of tissue has taken place. The circulatory channels are engorged with leukocytes. It should be noted particularly that the areas showing the greatest concentration of the infiltering cells follow closely the directional relationships of the connective tissue bundles in the central portion of the submucosa. The fibers themselves show some thickening. Since some of these are horizontal, the process extends horizontally. Again, these areas are perivascular. The epithelium is still definitely attached, but one will observe portions where there are relatively large numbers of lymphocytes invading it. Lysis of individual cells appears. Our conclusion here seems well based when we state that extension of the process follows connective tissue bundles through circulatory channels. It is subacute. We are inclined to the belief that horizontal extension is relatively slow, as we conceive the circulation in the gum to be mainly vertical rather than horizontal.

As the sequence progresses, rupture of blood vessels follows, attended by disintegration of the elastic fibers about these channels, as we have demonstrated repeatedly with Van Giesen stain. Edema and intoxication are effective to produce this, and thus hemorrhage becomes evident. There is also diapedesis of the erythrocytes through the walls of their retaining channels. The numbers of leukocytes are still large, but the change is rather an increase in the ratio of the numbers of red blood corpuscles to the white. The predominant leukocyte remains the lymphocyte. Following rupture, the still more advanced degree of destruction of the investing tissues is not only mechanical from the increase in pressure, but without doubt is cytolytic in character, induced by toxins, phagocytosis and enzymes, and also enzymes of destroyed leukocytes. Again, the change appears to be most intense within the submucosa. These alterations

17. Hatton, E. H.: Microscopic Studies of Diseased Peridental Tissues, J.A.M.A., 71: 1549 (Nov. 9) 1918.

are shown in Figure 5, which is likewise a horizontal labiolingual section. Here, after using a hematoxylin-eosin complex of stains, an attempt was made, in the photographic processes, to suppress the purples in part and to place emphasis on the reds. It is evident in this illustration that much tissue has been lost, since

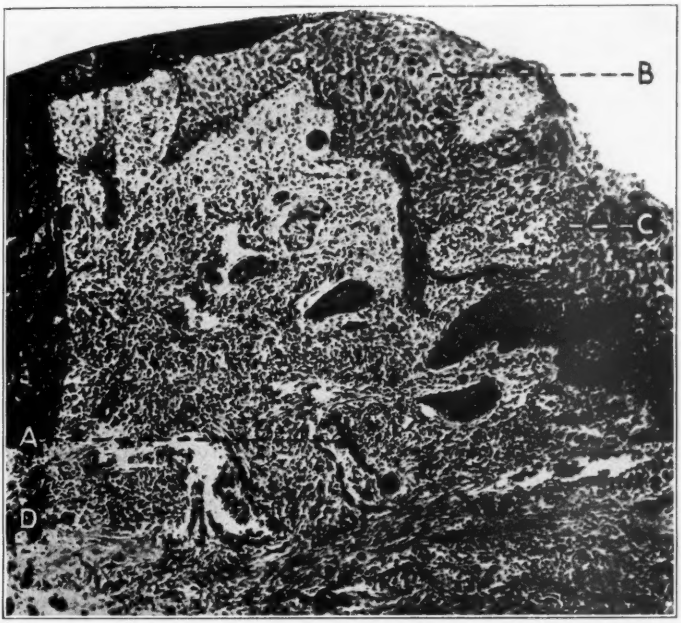

Fig. 5.—Hemorrhage in submucosa of gum; *A*, hemorrhagic area; *B*, karyolysis; *C*, pyknosis; *D*, Russell's fuchsin body.

erythrocytes and fibrin occupy much of the field. Thus, edema and the effects of lysis are both evident. Interest attaches to the epithelium also, for it will be seen that its stainability varies markedly. Edema and infiltration are to be noted in the upper areas. Whole sections of the epithelium in this particular region are undergoing degeneration, as indicated by nuclear karyolysis; that is, fading out of the nucleus. A few of them give evidence of pyknosis; that is, contraction and increased stainability of the nucleus; but we have not noted karyorrhexis, which is rupture of the nuclear membrane with migration of the chromatic material. In addition, the epithelial covering over the papillae, notably that included in the upper portion of the field, has become exceedingly thin, and some of the portions closely adjacent are about to slough off. The results of irritation are marked, but additional evidence of this fact is afforded by the presence of large numbers of Russell's fuchsin bodies.

Figure 6 shows a further step toward tissue disintegration. It is gingival tissue from the labial aspect of the tooth, to be designated as the lower right central incisor, a horizontal section cut labiolingually, then stained with hematoxylin

and eosin. The magnification is relatively low, and, by means of the proper selection of a color screen, an attempt has been made to equalize partially the chromatic effects on the plate of the purples and reds. The inflammatory sequence is in full swing, and the terminal results are commencing to appear. The epithelium has nearly all been lost. This condition is not due to an artefact. The papillae, denuded of their normal covering, have become the orifices of the abscesses draining from the midst of the submucosa, where the process is most advanced. Smears made originally from the surface of this gum showed large quantities of exudate consisting of cells in the various stages of disintegration. The source of such material may be seen at once from this photograph. Extensive lysis and phagocytosis have dissolved large amounts of the original tissue. The midst of the submucosa is occupied by areas of hemorrhage, fibrin deposition and infiltration of lymphocytes. The condition remains subacute, as typified by the lymphocyte. Attempts at healing have become evident, but such newly formed tissue as is shown in the lower portions of the plate is again attacked

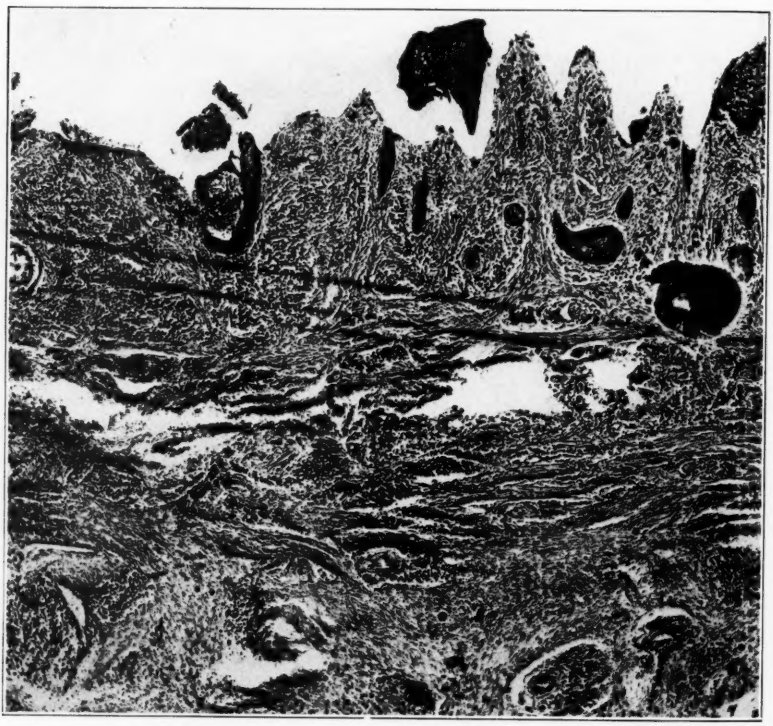

Fig. 6.—Gingival tissue showing stripping of epithelium, abscess formation from submucosa and attempted repair of tissue. Certain portions of the epithelium have been torn by the microtome in cutting.

with the usual inflammatory response. It appears to be always the lymphocyte that shows positive chemotaxis toward the stimulus. Thus, actual repair does not progress far. It is of interest again to state that our technical procedures designed to indicate micro-organisms, if present in this tissue, were nearly without result. A small number of cocci were shown, and the statements of Glynn[18] that but few bacterial forms are visible were thus substantiated. Russell fuchsin bodies again are apparent.

It is believed by Glynn[18] that infectious agents found in the gum are derived from the oral cavity by direct entrance through the weakened tissues covering the submucosa, and he marshals a formidable array of literary evidence to support his contention. Other authorities believe that their origin is hematogenous, since it is a demonstrable fact that, following intravenous injection of streptococci, some of these forms may localize in pulpal or apical tissues, although apparently not in the gum. These may present lesions that are invisible even in roentgenograms, as has been stated by Bumpus and Meisser.[19] One of us (T.D.B.) has isolated *Streptococcus fecalis* (Holman's classification)[20] in an apical condition that could not be demonstrated by repeated attempts with the roentgen ray. All possible care was exercised to exclude extraneous organisms by use of the rubber-dam, which, together with the tooth, was flushed repeatedly with 70 per cent alcohol. The tooth, which had been devitalized years previously, was then covered with three applications of tincture of iodin. All drills, broaches and other instruments, and the hands of the operator, had been carefully sterilized. A pure culture of *Streptococcus fecalis* was obtained, following inoculation into deep blood-glucose broth, and in addition stained smears of this material made from this area at the time of operation showed a streptococcus microscopically. We, therefore, can confirm the observations of the two authors just cited. Urbantschitsch[21] is reported to have stated recently that the dentin communicates with the cementum by means of an abundant system of canals. He bases his conclusions upon experimental methods of bone coloration. Box,[22] by an admirable series of photomicrographs, has shown recently that there is a series of anastamosing channels connecting the dentin and cementum in the apical third of the tooth, thus confirming the previous author. One may conceive, therefore, the presence of organisms in the gum derived from the pulp or apex. The difficulty, with such a conception lies in the fact that the lymph stream tends to flush infectious material inward through the periodontal membrane in a direction from the neck of the tooth toward its apex, as has been discussed by Hatton[17] and later by Skillen.[23] Thus, there is found a mechanical barrier to such a path of infection to the gum, whether from the apex or from the pulp. To us, such a channel thus appears to be unreasonable, and we are inclined to agree with Glynn.[18]

We know, as has been discussed earlier in this paper, that it is the belief of certain authors that a simple portal of entry for infecting micro-organisms, either primary or secondary, exists at

18. Glynn, E. E.: The Organisms Found in the Periodontal Infections and Their Relation to the "Toxaemia," Brit. Dent. J., Vol. 44, June 15, 1923.

19. Bumpus, H. C., and Meisser, J. G.: Foci of Infection in Cases of Pyelonephritis, J.A.M.A., 77: 1475-1478 (Nov. 5) 1921.

20. Holman, W. L.: The Classification of Streptococci. J. M. Res., 34: 377-443, 1916.

21. Urbantschitsch, E.: Wiener Vierteljahrschrift für Zahnheilkünde, 36: 1-15, No. 1, 1920.

22. Box, H. K.: The Dentinal-Cemental Junction, Oral Health, 12: 185, 1922.

23. Skillen, W. G.: Histological and Pathological Studies of the Peridental Membrane, Cementum and Dentin with Reference to Infections, J.N.D.A., 8: 621-631 (Aug.) 1921.

the attachment of the soft tissues at the cemento-enamel junction. It must be noted, however, that one of the immediate effects of the initial inflammatory process on the epithelial margin is to produce additional paths for infection. It is possible that abrasion of this protective coating by friction may produce a result closely similar likewise, Such an increased number of portals due to a primary infection, or even to mechanical injury, offers opportunity for extension of the area and for additional absorption of toxic or irritating solutions and suspensions. This condition is depicted well in Figure 7, which is material removed from the position buccal to the lower left second molar of a Mexican, aged 19. It is vertical, buccolingual in position. The field includes a portion of the tissue lying in contact with the tooth surface. The epithelial covering over the tips of the papillae is of the thickness of but two or three cells, and at one spot near the center of the picture has been lost entirely. Marked edema is evident in the connective tissue, especially in the papillary areas. There is much engorgement of the various circulatory channels. A large amount of

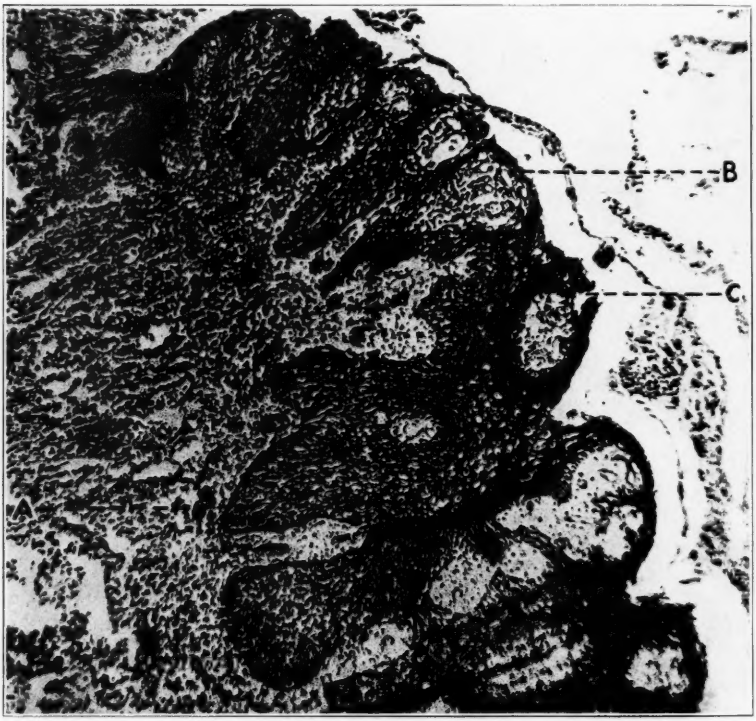

Fig. 7.—Deep infolding of epithelium between papillae and its loss over their tips on the inner surface adjacent to tooth. *A*, deep epithelial folds; *B*, very thin layer of epithelium; *C*, epithelium ruptured.

disintegrating material is apparent exterior to the epithelium, and this consists of desquamated cells, exudate and materies alba, all of which constitute admirable mediums for the growth of bacteria. The epithelium is deeply folded, as described by Endelman and Walker [10] and by Hatton,[17] who consider that this change is a portion of a chronic inflammatory process signalizing an attempt on the part of the tissue to afford additional protective covering in defense against invasion. That such response is in vain is shown by the extreme tenuousness over the papillae with their enlarged blood vessels. The epithelium itself shows marked degeneration with edema, infiltration by lymphocytes and karyolysis of nuclei. It is evident at once that tissue, in this condition, far from offering protection, affords many additional inlets for entrance of microbic forms and for absorption of toxic products.

Figures 8 and 9 are of much interest here on account of the fact that they offer interesting evidence for the statement that absorption of bacterial or other toxic products may induce breaking down of epithelial structure. These two sections were from material that we considered would probably be found normal in its histologic elements. It is merely another elevation of the tissue shown in Figure 1; that is, it lay at the lingual aspect of the upper right lateral

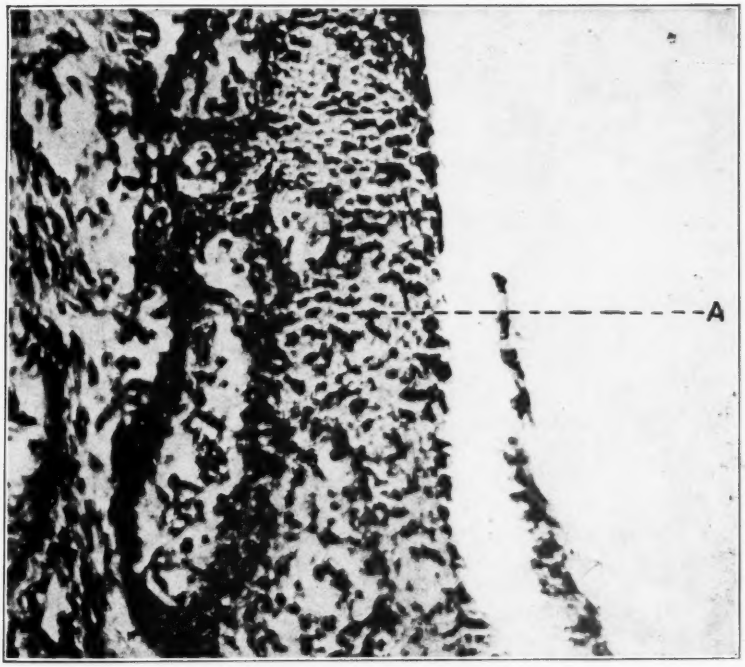

Fig. 8.—Epithelium adjacent to tooth, showing edema at *A*, and lymphocyte infiltration. (Compare with Figure 9.)

incisor but was 2 or 3 mm. distant from it. Again, it is horizontal, labiolingual. One will see at once that most certainly this tissue is not normal, for the epithelium was being disrupted markedly as shown by the hematoxylin and eosin. The epithelium depicted here is edematous. The nuclei show advanced disintegration even to the point of indistinctness. There is lymphocytic infiltration, and these changes are particularly noticeable over the papillae. The epithelium is that lying immediately over the gingival crevice. As this material proved to be so far removed from the normal picture, it was determined to examine it further by the more specially designed stains used for bacterial examination. The results of this are indicated in Figure 9, prepared with Gram-Weigert stain. Here, a photographic screen capable of suppressing nearly all of the red tints on a panchromatic film was utilized. The line of black at *A* indicated the mass of bacteria that were revealed, although the broader portion extending inwardly and at right angles is an artefact caused by a small fold in the section. Figure 8, then, shows the effects at *A*, which in all probability were produced by the line of invaders indicated in Figure 9. Examination with the oil immersion lens on a binocular instrument showed that these forms were rods, some of which were probably diphtheroids, judging by their pleomorphism,

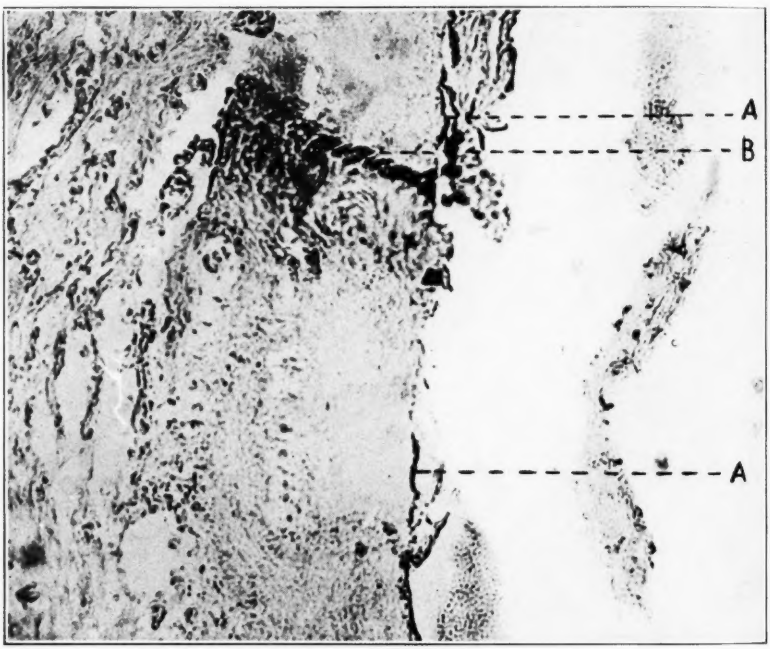

Fig. 9.—Area of epithelium shown in Figure 8, but stained to demonstrate gram-positive micro-organisms. *A*, lines of bacteria; *B*, an artefact procured by small fold. (Compare with Figure 8.)

streptococci and staphylococci. Silver precipitation revealed no spiral forms.

A condition similar to that demonstrated in Figure 9 is shown in Figures 10, 11 and 12, where again gram-positive organisms may be seen embedded within the epithelium after use of the Gram-Weigert stain. In each case, this covering showed degeneration, as decolingual in plane. A screen was used in this last that offered less resistance to the photographic impact of the red rays, with the result that the masses of organisms do not stand out so distinctly. However, they are indicated at *A*. As mentioned before in the discussion of Figures 8 and 9, oil immersion examination satisfied us that the forms found here

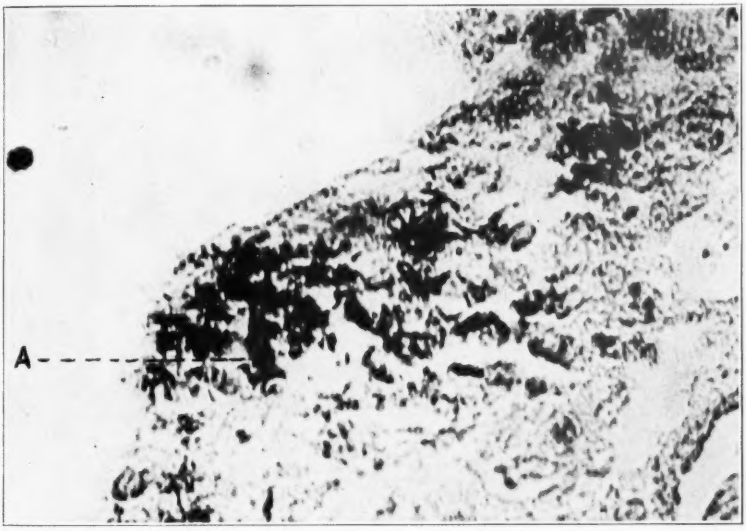

Fig. 10.—Invading organisms in epithelium at *A*.

scribed previously. Figure 10 is to be described as a horizontal buccolingual section of the gum immediately outside the lower left second molar of a youth of 19 years. The surface is that lying next to the tooth. In Figure 11, we have gum from the outer surface of the upper right second molar of a young woman of 26 years. This section is vertical, buccolingual, and the field here photographed is at the upper edge of the gingiva. Figure 12, tissue from a man 25 years old, was removed from the buccal surface adjacent to the upper right first molar tooth, cut vertically and buccolingual in plane. A screen was used in this last that offered less resistance to the photographic impact of the red rays, with the result that the masses of organisms do not stand out so distinctly. However, they are indicated at *A*. As mentioned before in the discussion of Figures 8 and 9, oil immersion examination satisfied us that the forms found here are rods and spheres. The rather uneven tinctorial reactions of some of the rods was suggestive of the possibility of their being diptheroids in part. Others of them were doubtless mere saprophytes. No spores were found. The spherical forms were both streptococci and staphylococci. Few or no spiral forms were revealed by technic adapted to such purposes.

We admit that there is no infiltration area in close contact with the organisms depicted in these three figures. It thus may be inferred by some that this is a necrotic tissue. Hematoxylin-eosin sec-

tions in this area showed some alterations of the cellular structures, but the nuclei and cytoplasm remained well differentiated. Even this point does not prove that coagulation, as an early stage of necrosis, had not taken place. In addition to the foregoing, we know of no work that proves the existence of a positive cellular chemotaxis within the tissues for these particular kinds of rod-shaped organisms. Thus, we are unwilling to make any definite decision regarding the condition of life or of death of these portions of epithelium. If the reader prefers to consider this material necrotic, the following line of reasoning must not be ignored. It is possible that these forms are saprophytic in habit, but Goadby,[24] years ago, endeavored to prove that oral nonpathogenic bacteria are potentially infectious. If his conclusions are correct, they may apply to microorganisms in such sites as these. In addition, these fields include many spheres interspersed with the more numerous rods. Certainly, the latter should be classed as potentially pathogenic.

The further advance of micro-organisms through disrupted epithelium into the submucosa is pictured in Figure 13, which was removed from the gum buccal to the upper right second molar tooth. The section was cut horizontally and is buccolingual. The surface is that next to the tooth. The stain is carbol-thionin. Here, we note that complete destruction of the epithelium proximate to the enamel has taken place, and that this area of lysis extends well into the inner fibrous tissue, which also shows much inflammation. Masses of organisms are at points designated at *A*, and their mechanical path for further advance is thoroughly evident. Microscopically, they are small gram-negative rods.

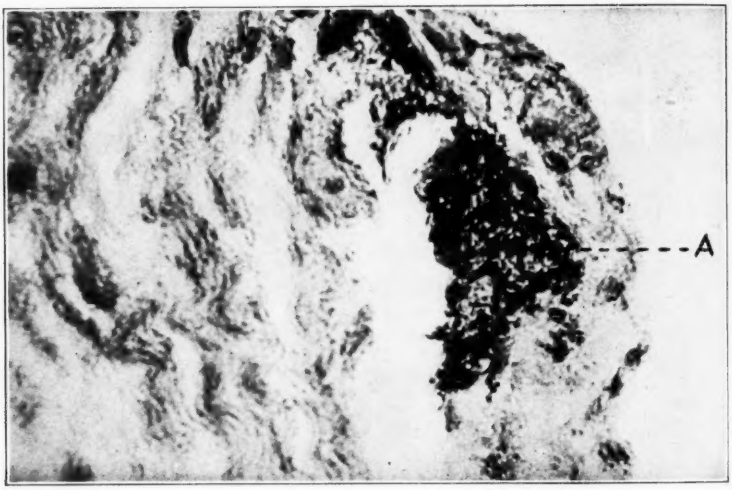

Fig. 11.—Invading organisms in epithelium at *A*.

Blood clot and fibrin also may offer a satisfactory pabulum for the growth and advance of bacterial forms. Thus, hemorrhage of itself may further their prog-

24. Goadby, K. G.: A Preliminary Note on the Pathology of Oral Sepsis, Brit. M. J., 2: 1363-1367, 1904.

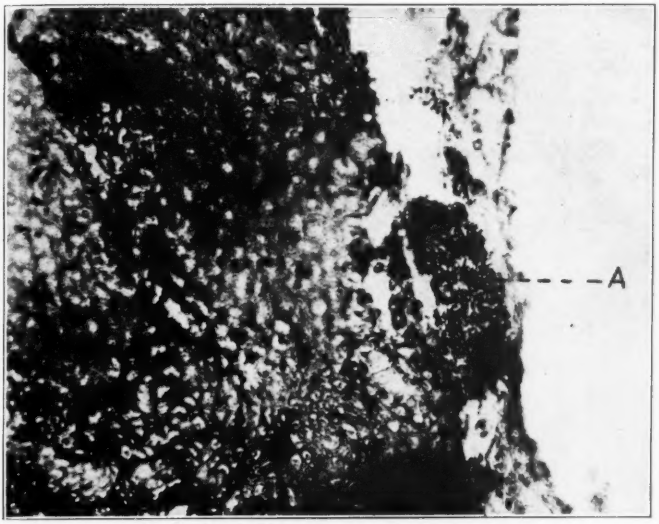

Fig. 12.—Invading organisms in epithelium at *A*.

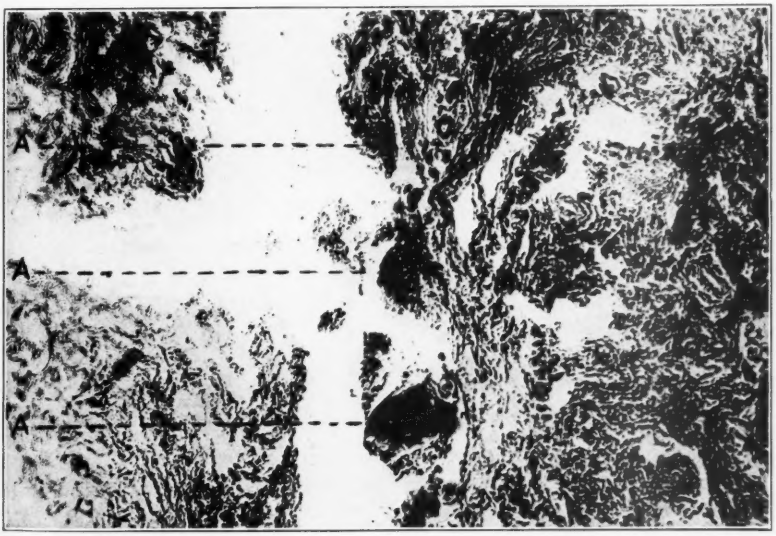

Fig. 13.—The advance of micro-organisms into the submucosa through disrupted epithelium. Centers of bacterial growth are shown at *A*.

ress. This fact is presented in the field shown in Figure 14, prepared by Levaditi's method, with silver impregnation. The forms, which in this particular instance were mainly rods, occurred as masses with individual units migrating into the inner portions. No spirals were discernible. This material was removed from the buccal aspect of the lower left first bicuspid tooth of a man of 31 years. The section itself was cut vertically, buccolingual in plane. The site of this hemorrhage was next to the epithelium, which is shown at the edge, and again this epithelial covering is that which faces the tooth.

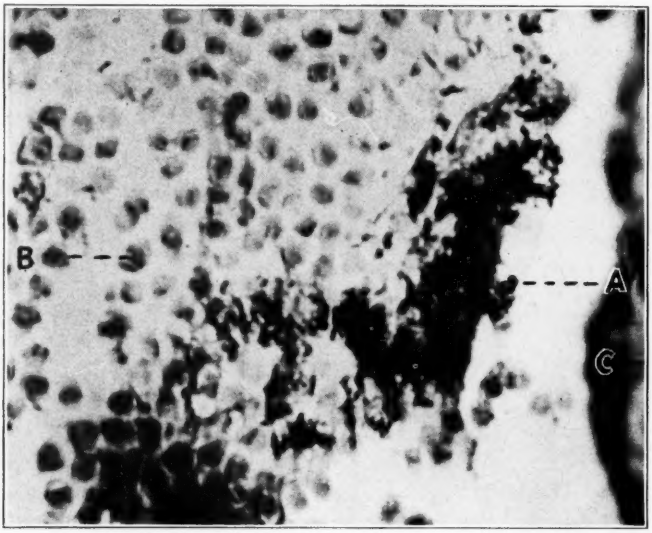

Fig. 14.—The advance of micro-organisms into submucosa by blood clot; *A*, organisms; *B*, erythrocytes; *C*, epithelium.

There are a number of observers, among whom may be mentioned Massia and Grigorakis,[25] Kritchevsky and Séguin,[5] Cavalié and Mandoul[26] and Keilty,[27] who believe that spiral-formed organisms are to be considered as causative agents in pyorrhea. On the other hand, Meyer[28] and Glynn,[18] are of the opinion that they are adventitious merely. It is certain that these forms swarm in great numbers in areas of necrosis, so that their presence under dark-field examination may be said to indicate a process of disintegration. Therefore, such an examination is pathognomonic, when

25. Massia, G., and Grigorakis, L.: Sur le role pathogène du Spirochaete dentium, Compt. Rend. Soc. Biol., 87:547-548, 1922.

26. Cavalié and Mandoul: Note sur un spirochaete le Spirochaete perforans nov. sp., renontré constamment dans les lésions de la polyarthrite alvéolo-dentaire expulsive (pyoorhee?), Compt. Rend. Soc. Biol., 85: 1068-1069, 1921.

27. Keilty, R. A.: A Bacteriological Study of the Gums in Two Hundred Cases; Focal Infection, J.M.Res., 43: 377-385, 1922.

28. Meyer, K. F.: The Present Status of Dental Bacteriology, J.N.D.A., 4: 966 (Sept.) 1917.

positive. That does not prove that the spiral forms are primary invaders, but rather that it is possible that they are stimulated to multiplication by increase of food supply; that is, degenerated cell structures. Our histologic preparations did not show spirals in process of penetration into gum tissue, although Levaditi's method did indicate many of them on the surface of the gum. We feel, therefore, that the belief of these first named workers is not of general application, at least we cannot confirm them.

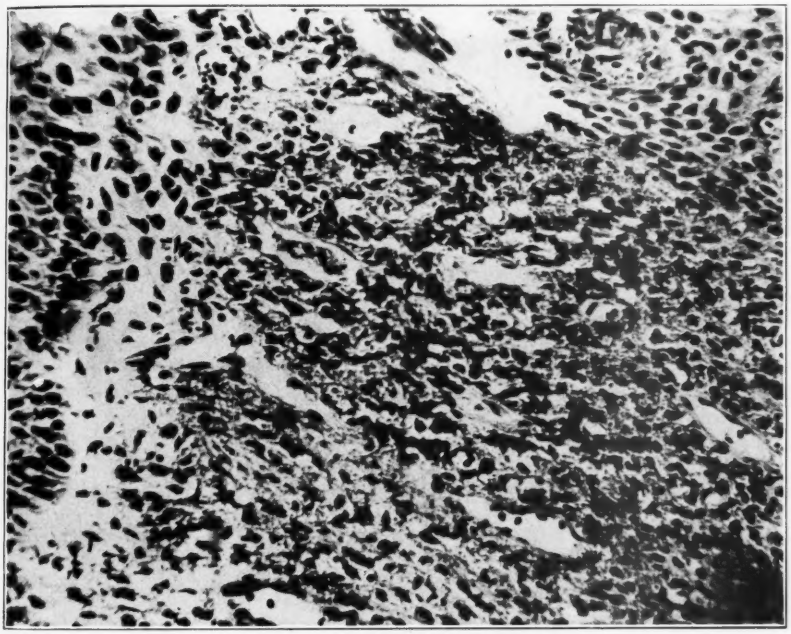

Fig. 15.—An area of infiltration with edema in submucosa of gingiva. The lymphatics show rupture as shown in Figure 17.

Turner and Drew,[29] in their admirable series of photographs, depict bacterial rod forms in the lymph channels, and other authors have assigned to the lymph channels the rôle of distributors of bacterial infecting agents. It is conceivable that a motile rod may be able to make its way by means of its own movement intracellularly into such a minute sinus. In addition, one is permitted to feel that such forms also may be able to grow through tissues and thus be enabled finally to penetrate the lumen of a lymph sac, provided a sufficiently vigorous defense is not offered by the tissue thus invaded. We have endeavored to show that there may occur a path of invasion into the lymph channels even more direct and simple than those noted in the foregoing sentences, and our results are reproduced in Figures 15 and 16, where

29. Turner, J. G., and Drew, A. H.: An Experimental Inquiry into the Bacteriology of Pyorrhea, Proc. Roy. Soc. Med., Pt. 3, Odontol., 12: 104-118, 1918, 1919.

we have found such channels with walls definitely lost, in part, in the inflammatory areas.

The section in Figure 15 was prepared with iron hematoxylin stain and for purposes of orientation may be surveyed as follows: labial to the upper right cuspid tooth and cut horizontally on the plane, that is labiolingual. It is in the midst of the submucosa with the peripheral epithelium showing at the edge. The man was 55 years of age. Figure 16 shows a section adjacent and buccal to the upper right second molar tooth and again is buccolingual at right angles to the main axis of the tooth. This area likewise is submerged in the connective tissue of the submucosa. The stain, which was hematoxylin and eosin, indicates an advanced degree of destruction of the portion with edema and lysis. One can make out only with difficulty the very irregular outline of the lymphatics, since only careful focusing through the tissue can make the disruption clear. For additional evidence, we have endeavored to clarify our

Fig. 16.—An area of infiltration with edema in submucosa of gingiva. The lymphatics show rupture as shown in Figure 17.

findings for the reader by use of the camera lucida, which shows diagrammatically in Figure 17 the destructive effects on these channels from the portions designated. It is thus evident that these confining tissues, delicate at best, have become damaged through intoxication in this pathologic condition. Thus, the path for invading micro-organisms in close contact is open and free for their advance and further distribution. Provided the humoral and cellular response on the part of the host is not definite and active, there is little reason why, mechanically, the invading micro-organisms, whether primary or secondary, should not be spread to distant portions of the body. In this connection, the work of Gay,[30] wherein he indicates that streptococci are scattered through the lymph channels, should be borne in mind.

It is logical to expect that, following the foregoing discussion, in which we state that there is every reason to believe that the lymph circulation may offer a means of transport for infectious agents for extension throughout the gum to the periodontal membrane and even to more remote portions of the body, evidence of the presence of such micro-organisms should be presented. This we are about to do by use of the material shown in

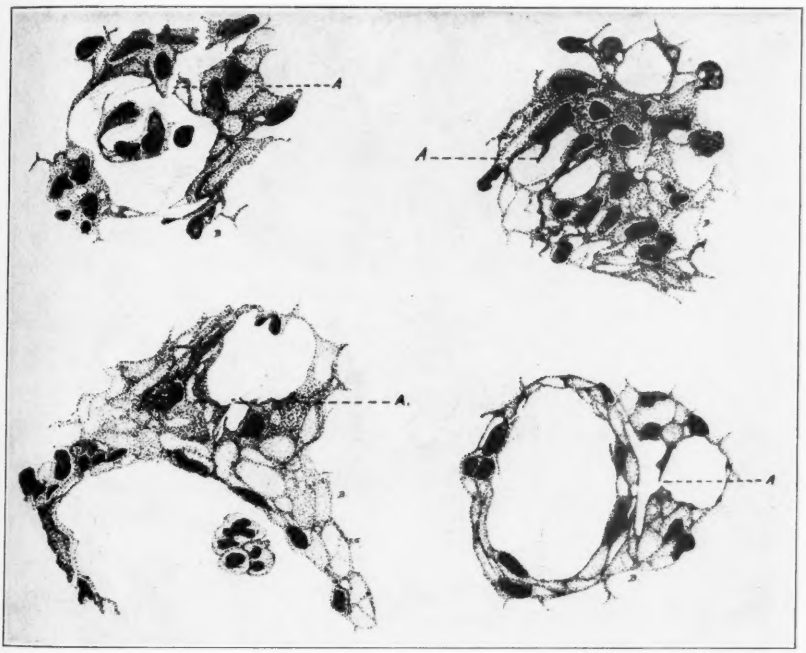

Fig. 17.—Camera lucida drawings of ruptured lymph channels in material shown in Figures 15 and 16. Points of rupture are indicated at *A*.

30. Gay, F. P., Rhodes, B.: Experimental Erysipelas. Studies in Streptococcus Infection and Immunity. IV. J. Infec. Dis. 31: 101-115 (Aug.) 1922.

Figures 18 and 19, both of which were prepared with Nicolle's carbol-thionin. Each was taken with the oil immersion lens at an estimated magnification of 3,000 diameters, which explains but does not excuse entirely the lack of sharpness. Careful examination with the eye shows that the forms are small cocci or exceedingly short and minute rods present in masses. They are not artefacts. Each

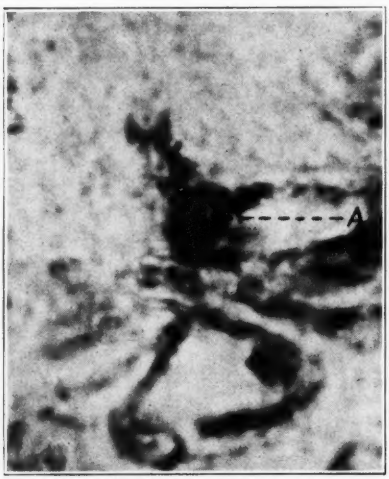

Fig. 18.—Micro-organisms at *A* in lymph channel.

area lies in the midst of the submucosa just outside the periphery of a field of infiltration. There is slight though positive edema. Both were made from the same material, which was taken from the gum lying buccal to the upper right first bicuspid tooth of a man, aged 29 years. This block was cut vertically in the buccolingual plane. It is of special interest to note that the impaction of these micro-organisms had not become sufficiently complete in Figure 19 to block entirely the lumen of the lymph duct, since its lumen is still evident through the central portion of the mass. These forms must be gram-negative, as gram staining did not reveal them in other sections closely parallel and treated by Gram-Weigert processes.

A very considerable amount of interest is attached to the filamentous form found in many mouths and known as leptothrix. It is one of the higher forms of bacteria and was described first by Vincentini.[31] There is no reason thus

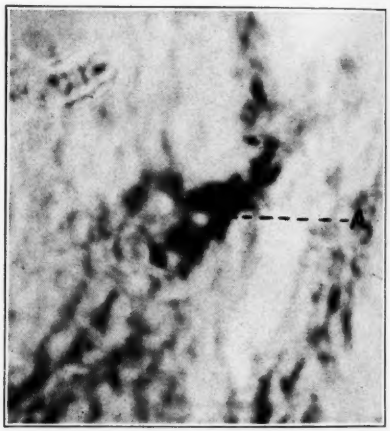

Fig. 19.—Micro-organisms at *A* in lymph channel; lumen not entirely blocked.

far demonstrated for considering it pathogenic, but the probabilities are that it is a saprophyte thriving on tissue detritus. The work of Goodrich and Moseley[32] tends to increase of valuation of the importance of these forms, since these authors ascribe to them a definite function in the precipitation of lime compounds and thus with the formation of

31. Vincentini, F.: Bacteria of the Sputa. London, 1897.

32. Goodrich, H. P., and Moseley, M.: On Certain Parasites of the Mouth in Cases of Pyorrhea, J. Roy. Microscopic Soc., 1916, 513-527.

calculus. Kofoid and Swezy[33] more recently have added some most interesting observations, which may indicate a relationship between them and the amoebas of the mouth. In Figures 20 and 21, colonies of these organisms are pictured. Each of these is an area comprising

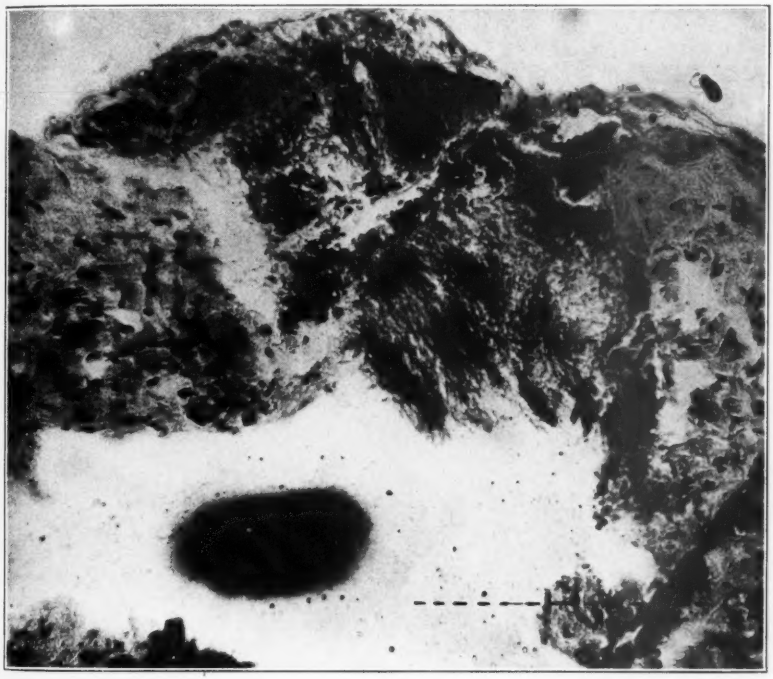

Fig. 20.—Leptothrix, at *A*, growing on disintegrating epithelium; *B*, site of destroyed submucosa, *C*.

necrotic epithelium and with an adjacent field showing liquefaction of tissue. We assume that here these micro-organisms are acting as scavengers. Carbol-thionin

33. Kofoid, C. A., and Swezy, Olive: The Cytology of Endamoeba Gingivalis (Gros) Brumpt Compared with That of E. Dysenteriae with Special Reference to the Determination of the Amoebas in Bone Marrow in Arthritis Deformans of Ely's Second Type, Univ. Calif. Pub. Zool., 26: 165-198, 1924; J.A.D.A., this issue, p. 175.

comprised the staining agent, with the usual background produced by a small amount of eosin. The material depicted in Figure 20 was derived from the gum adjacent on the buccal aspect of the upper right first molar tooth of a man, 25 years of age. The section is cut vertically and is buccolingual. Figure 21 shows tissue removed from the same position in another man, 55 years old, but the plane of this section is horizontal, buccolingual. In each, the growth is on epithelium.

The material shown in Figure 22 is of interest. The form is that of some fungus. Mycelium and fruiting bodies are both evident. It was revealed by the Gram-Weigert technic, and in this pic-

ture lies in a cleft of disintegrating epithelium. Careful examination of the original tissue shows more of the mycelium, which appears to be penetrating to a somewhat slight degree. The site of the material was the gingival crevice of the upper right second molar tooth in a case in which the pyorrheal process was well advanced. We believe that this form is saprophytic in character.

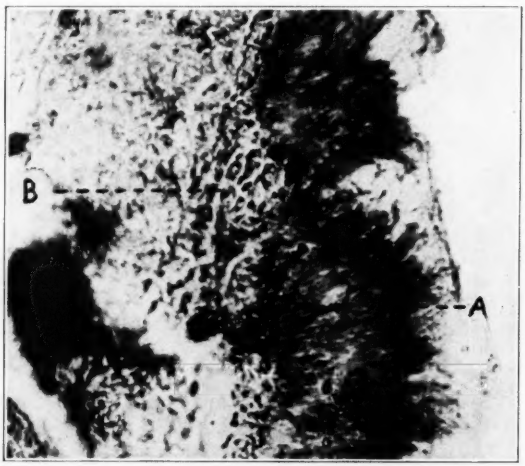

Fig. 21.—Leptothrix at *A* growing on disintegrating epithelium at *B*.

Summary

We have no reason to ascribe the cause of pyorrhea to any organism at present. We do believe, that there is strong reason to think that there is a logical and simple path for infectious organisms to follow from the gum to the apex of the tooth through the periodontal membrane. Moreover, we are of the opinion that infectious processes complicate and intensify the dental entity known as pyorrhea. There is evidence that the portal of entry is to be found within the attachment of the gingival epithelium to the tooth surface in the gum crevice. Mechanical trauma or irritation derived from toxic disintegrating material may produce the relatively slight injury necessary for opening this path. The connective tissue in the submucosa is exceedingly loose and open in structure. Thus infection mechanically may extend through it readily. In addition, the papillae are vascular to the tips. Microorganisms thus are free, if we leave out of consideration immune factors, to move to the depths of the submucosa. Here the infiltration is perivascular and the inflammatory reaction is subacute, being attended by lymphocyte infiltration. Polymorphonuclears are few in numbers or lacking entirely. The inflammatory reaction follows the directional influences also of the connective tissue bundles and thus spreads more or less slowly in a line parallel to the gingival crevice but within the submucosa. It progresses to abscess formation. Repair is a difficult process attended by many interruptions. The agents of infection penetrate the lymph channels by their own motility or proliferation or as a result of lytic action upon the walls of these spaces. Inasmuch

as drainage from this area extends down the periodontal membrane toward the apex, this is the logical route for such advance to the root or to portions of the body even more distantly removed. Microbial forms are shown in this site in the lymph sacs.

The incidence of potentially and actively pathogenic organisms in the gingival crevice is such that it is unexpectedly difficult to find gum tissue which may rightly be classed as normal. The effects produced by these microorganisms are shown, together with the colonies of the bacteria themselves. Advance is made through these areas by the pathway produced by lysis of tissue, by hemorrhage and possibly by other agencies.

We find no grounds based upon histologic technic for stating that infection was being produced in these particular cases examined by us through the agency of spirillums or of spirochetes. On the other hand, the forms seen by us have been rods of which some are apparently diphtheroids, and with these are streptococci and staphylococci.

Finally, some interesting evidences of the presence and growth of leptothrix and of a certain fungus form are presented.

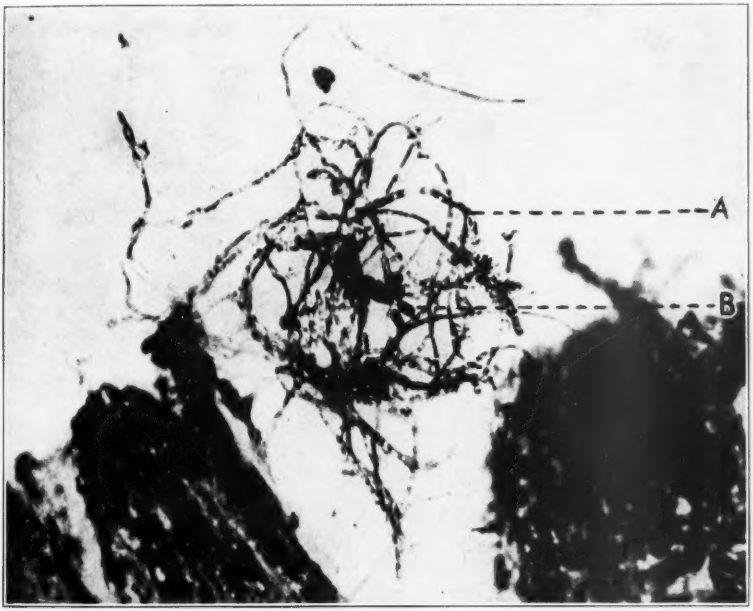

Fig. 22.—Fungus from growing in cleft of epithelium; *A*, mycelium; *B*, fruiting bodies.

THE VALUE OF SYSTEMATIC CHARTING OF RECORDS IN PROSTHETIC WORK

By W. H. WRIGHT, D.D.S., Pittsburgh, Pennsylvania

(Read before the National Society of Denture Prosthetists, Cleveland, Ohio, September 4, 1923)

SCIENCE depends for its development on facts gleaned by devotees from their personal experience and compiled for the use of all those who are interested. Dentistry, as a branch of science, is no exception to the rule, for many times it has been the recipient of numerous facts presented by some unselfish practitioner, who, at both ends of a busy day, year after year, has taken time to record those observations, which are now accepted.

I believe that each practitioner, with a little additional effort, can become a unit in an organization capable of unveiling facts with surprising rapidity. Each dental operation demands a well defined technical procedure and likewise an accurate record of the same.

The prosthetist must answer three questions to his own satisfaction during the construction of dentures: What conditions are present? What should be done, and why? What will be the results?

Briefly, we are face to face, in prosthetic work, with the same three questions that affect the remainder of the world. The physician, the business man and the sportsman must answer them intelligently or fail. They must be answered.

The extreme importance of the first question is evident at a glance, and yet it is doubtful whether more than those who are profoundly interested in prosthesis take a second glance into the edentulous mouth in an attempt to understand the conditions present.

The very fundamentals of success in any profession or art are overlooked as unessential by many who are engaged in prosthetic restoration. It cannot be denied that a great measure of success sometimes attends despite this carelessness, but how much better would be the results if an intelligent diagnosis had been made?

The business world has found it advantageous to keep written records answering these questions. The surgeon depends on such a record before and after operating. Surely, the dentist cannot deprive the patient or himself of the valuable information contained in a well kept record system.

"What conditions are present?"

Every patient presents definite conditions, which are either evident or obscure, depending on our ability to detect or analyze them. An experienced hunter hears a sound in the underbrush, sees nothing but the shaking bushes, but the sound is familiar and two short horns appear above the brush.

"What should be done and why?"

The high powered rifle spits fire because experience has taught this huntsman that certain evident conditions represent other obscure conditions. Those short horns stand for deer. They are the signals for a well defined action, in this case that of firing.

"What are the results?"

That depends on the conditions present, the ability of the individual and the accuracy with which the work is done.

UNIVERSITY OF PITTSBURGH - SCHOOL OF DENTISTRY

DEPARTMENT OF CLINICAL PROSTHESIS

DENTURE CHART

PATIENT	
ADDRESS	
PHONE	
Age	
Nationality	
Color Hair	
Complexion	

Teeth Selected (Shade No..... / Mould No....)

SIZE

	ANTERIORS WIDTH R.—L.	ANTERIORS LENGTH R.—L.	POSTERIORS WIDTH R.—L.	POSTERIORS LENGTH R.—L.
Upper	..... m.m.	..... m.m.	..... m.m.	..... m.m.
Lower	..... m.m.	..... m.m.	..... m.m.	..... m.m.

Kind of Former Denture	
Years and Kind of Service	
Former Denture Wherein Deficient	
Mark Teeth Last Extracted	R 8 7 6 5 4 3 2 1 | 1 2 3 4 5 6 7 8 L R 8 7 6 5 4 3 2 1 | 1 2 3 4 5 6 7 8 L
When Extracted	
Mental Attitude	1. Receptive 2. Passive 3. Exacting 4. Antagonistic
General Health	1. Robust 2. Average 3. Frail
Saliva	Amount: 1. Normal 2. Slight 3. Excess — Condition 1. Mucus 2. Serous
Tongue	Length: 1. Med'm 2. Long 3. Short — Width: 1. Wide 2. Narrow — Thickness: Thick Thin — Muscles: Strong Weak
Throat	1. Large 2. Avge. 3. Small — Movable Tissue is.....m.m. from Margin of Hard Palate — Immovable Portion is 1 Resistant 2 Yielding 3 Flabby
Muscles of Mastication	*Development*: 1. Average 2. Strong 3. Weak — *Movement*: 1. Bilateral 2. Unilateral 3. Free

STUDY MODELS

Impressions	
Ready to Mount	
Mounted	
Received by	
Serial Number	

REMARKS:

STUDENT	
CLASS	
NUMBER	

Kind of Denture:

	GRADE	
Impression { Compound / Plaster		
Impression Prepared to Pour		
Cast		
Occlusion Rims Adapted to Patient		
Central Occlusion Registered		
Mounted { Case / Study Models		
Upper Teeth Set to Guide-block		
Trial Set-up Tested in Mouth Study Models Tested—Turned-in		
Articulation Completed		
Waxing Finished Wax Bite for Re-Mounting		
Flasked Separated Wax Removed		
Trial Closure { Packed ..... / Closed ..... / Opened		
Vulcanized		
Polished		
Remounted and Ground-in		
Inserted		
Adjusted		
Adjusted		
Adjusted		
Adjusted		
Adjusted		
Adjusted		

LINGUAL BAR - CLASPS - GOLD BASE

Impression		
Die - With Wire Measurements		
Clasps or Gold Base { Swaged or Cast		
Bar Formed - Soldered		
Bar and Clasps Assembled		
Soldered		
Completed		
CASE COMPLETED		

Denture Hygiene	Good	Fair	Poor

STUDENT No.....

Fig. 1.—Denture chart.

If we concede the hunter to be a good shot, the distance reasonable and the aim accurate, in most cases the deer's head will adorn some mantel place.

So in prosthetics: If the operator be skilled, the conditions recognized, and the work done accurately to meet conditions present, a satisfactory result may be expected.

During the past few years, I have been in a position to realize the value of systematic recording of prosthetic work. After many changes, a method has evolved that, at the present time, is fairly satisfactory for general use.

Each practitioner may apply modifications suited to his specific requirements. There are many fundamental points, and they should be recorded in as simple, concise and intelligible a manner as possible, so that they may be interpreted correctly.

I appreciate the fact that a technic differing from the one outlined in the chart will require a change of detail. Each step in the work is recorded, leaving a space sufficient to allow for entering the date and the time consumed.

Time is a very important factor with the dentist and should be accurately recorded. Many operators will experience some surprise when, for the first time, they actually realize how many working hours have been employed in the construction of a complete maxillary mandibular restoration.

The chart shown in Figure 1 is printed on ledger paper, on both sides, the paper being standard letter size, 8½ by 11 inches. The front of the chart is divided into a right and left half. The right column contains a list of each important step to be executed, from the impression until all adjustments are made. The left column contains a list of all data to be recorded, except that which requires drawings (Fig. 2). The back of the chart is devoted to graphic records or drawings upon which figures or letters are superimposed to indicate conditions present.

The patient's name, address and telephone number are placed at the head of the column and the following points in order.

Age and Sex.—The age and sex of the patient are ofttimes determining factors in the procedure followed. Our patients, in the matter of ages, come close to the two extremes of life. To mention 14 and 80 years demonstrates the possibilities in this respect. Youth is the period of adaptability, and it is right to assume that the first denture experience is more successful as a rule with individuals under 40 years of age. A tabulation of the age of many using full upper and lower dentures places the mean average at 48 years and 9 months, showing the necessity of prosthetic restorations at that period of life when the patient has become "set" in habits, which adds at times an additional burden on both prosthetist and patient.

The Nationality.—This factor deserves consideration in restorations. We must harmonize mental attitude, osseous development, alinement form and tooth form. These factors vary with nationality.

Color of Hair and Complexion.—Since the teeth harmonize with the skin in color, it is well to determine as nearly as possible the general tint of the skin and to record and utilize all other factors that make up the sum total of the facial color scheme. Much may be learned by observing Nature's color schemes, and it is surprising how accurately one selects the proper color after a little study of Nature's way of combining them.

Selection of Teeth.—Space is provided in which to record the hue, mold and size of the maxillary and mandibular anteriors and posteriors. The value of this record is fully appreciated at a later date when repair or remaking is necessary.

Kind of Former Denture.—The patient who previously has used dentures possesses, through experience, a means of

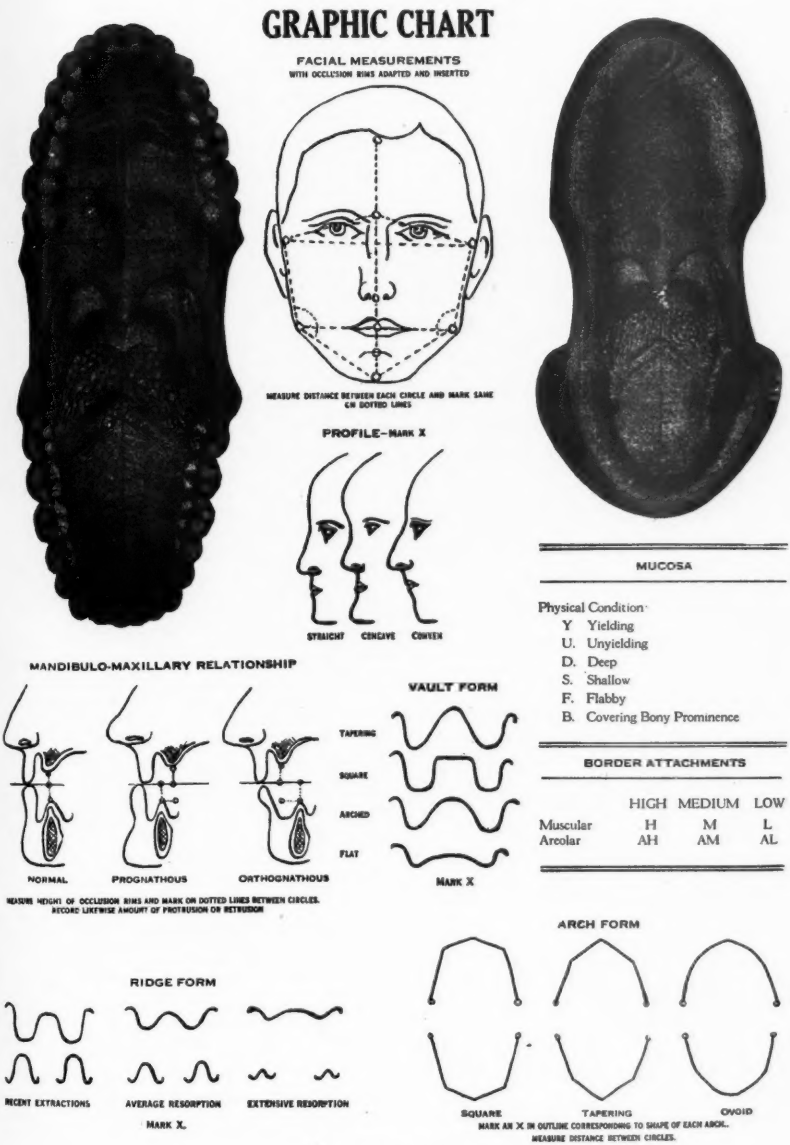

Fig. 2.—Graphic chart.

making a comparison that is either favorable or unfavorable to the present undertaking. Human nature, continually looks to the past, forgets its faults and sorrows, and clings to the good old days.

Years and Kind of Service.—In many cases, habit has so established certain positions and movements of the mandible or dentures, in ill-fitting ones, that these and other peculiarities have become a part of the patient to the extent that they present difficulties in the way of correction. This condition is more manifest when dentures have been worn for a considerable time.

Former Denture; Wherein Deficient.—Here the operator has it in his power to change the "tide of battle." The patient has a reason for desiring new dentures and if given an opportunity will tell the defects of the old set. Criticism on the operator's part can only minimize the results.

Unless the patient is intolerable, it is advised that the prosthetist try to eliminate those undesirable features from the new dentures. It must not be forgotten that there is a dental side to every such story.

Last Extraction and Date.—Diagnosis should be made of probable complications in the masticatory unit, such as unilateral movement, widening of angles, lack of symmetry of the mandible and permanency of the residual ridges. Prognosis as to retention, comfort and service frequently is possible after this information has been obtained.

Mental Attitude.—Much has been said about mental attitude. The common types are simply identified by the four words receptive, passive, exacting, antagonistic. Every operator classifies his patients in some manner, although not conscious of such mental act until his attention is directed to it. This is one argument for recording the mental attitude. The operator who understands something of the patient's attitude has fortified himself with an additional aid to success.

General Health.—Good health is essential to success with dentures. There are times when dentures are a direct aid to recovery from illness. The sound body, however, responds much more favorably to denture restoration.

Saliva.—An excess of mucus or a slight amount of serous saliva may destroy the most perfect retention. Saliva flow is stimulated by the insertion of foreign materials into the mouth, and the saliva should therefore be examined when the flow is normal.

Tongue.—The tongue is an unruly member and particularly is this true in denture work. The tongue demands space for freedom of movement and has a peculiar faculty of upsetting things when interfered with.

Throat.—The tissues at and immediately posterior to the palatal margin of an upper denture have a decided influence on retention. The greater the extent of nonmuscular but yielding tissue, the greater will be the likelihood of retention. A large amount of yielding tissue in this region serves to compensate unfavorable conditions such as flabby or resistant tissue in the anterior region of the arch or a prominent bony area in the palate that encroaches on the normal palatal margin of the denture. Measurement of this area can be made when the soft palate is in motion and should be recorded in the space provided. It is needless to say that the presence of very resistant tissue in this region will prove disastrous to retention.

Muscles of Mastication.—The loss of teeth has a direct influence on the muscles of mastication. The muscles not only atrophy owing to the lack of normal function, but also develop modified positions and movements that must be taken into consideration when the case is restored. In cases in which the teeth have been lost for a considerable time, the mandible, through misuse, develops abnormal movements, which we term "free," that is, movements that do not coincide with those accepted as normal.

In practice, we most frequently find muscles of average strength with bilateral movement.

Denture Hygiene.—Observation of an old denture or the new one when adjustments are made will frequently show quite clearly the cause of a patient's trouble. Inflammation of mucosa, increased flow of saliva, loss of suction and soreness are some of the many conditions due to unhygienic dentures. More care is necessary in this respect with dentures than with the natural teeth.

Graphic Record.—A cut of the wide open dentulous mouth (Fig. 2) permits, in partial denture work, an outline of the proposed restoration, the teeth to be replaced, those to be clasped or used for retention and notations of the physical condition of the mucosa. A similar cut of the edentulous mouth provides space for a written record of conditions as they are found.

By the use of the initial letter of the words yielding, unyielding, deep, shallow, flabby and bony, the condition of mucosa over the ridges or in the palate can be definitely recorded. Border attachments are marked *H, M* or *L,* meaning high, medium or low muscular tissues, which can be located about the periphery of the cut where they are found. Areolar attachments are likewise recorded by using the same letters in conjunction with the letter *A,* as *AH, AM, AL.*

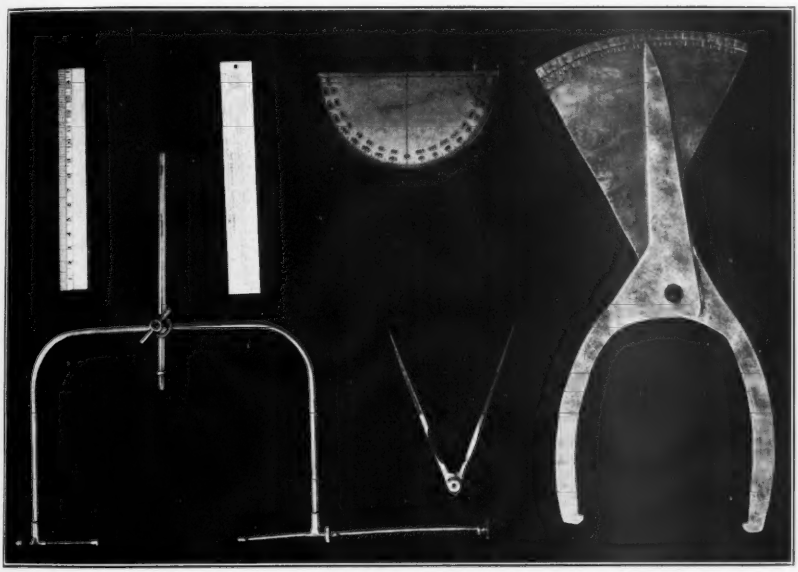

Fig. 3.—Instruments for making measurements.

The word high indicates tissue near the crest of either ridge; medium, between the crest and base; low, at the base of the ridge.

In addition to preceding records, it is desirable that measurements of cast—size and height of border attachments—be recorded on this cut.

Facial Measurement.—A front view outline of the face permits a series of

measurements that assist in determining symmetry of facial proportion and degree of the mandibular angle, and aid in reestablishing the intermaxillary space. I have been interested in making a collection of data pertaining to this, which at present are not in presentable form. These measurements can be taken with the aid of a Snow face-bow or a caliper with curved ends (Fig. 3).

Profile.—The facial profile is indicated by an *X* superimposed on one or more of the three cuts representing the three typal forms—straight, concave and convex. These forms correspond closely with the three jaw relationships, represented by the next three cuts.

Mandibulomaxillary Relationship.—In addition to recording the relationship, which may be normal, protruded or retruded, dotted lines and circles indicate the distance between the reestablished ridges and the amount of retrusion or protrusion.

Vault Form.—Vault form, which is dependent to a great extent on anatomic development, is changed by resorption of the residual ridges.

Ridge Form.—Ridge resorption, one of the most important considerations in full denture work, can be recorded as recent, average or extensive for any particular part of either cast, by simply marking outlines with an *X*. The same marking between the posterior ridges indicates similar resorption in the anterior region.

Arch Form.—This offers a great advantage to the mechanical placement of teeth and at the same time undergoes a change in outline form that varies with the amount of resorption. There is a great tendency for the upper arch form to assume an ovoid or tapering ovoid and the lower an ovoid or ovoid tapering outline as resorption continues.

While the square type may be found in the maxilla, it appears to be almost lacking in the mandible.

A carefully compiled chart, such as has been described, provides an adequate method by which to collect and record data, but is incomplete without study models of each case (Fig. 4). Study models can readily be made by taking impressions of the original casts. These impressions are poured with some permanent material. The models are placed in the

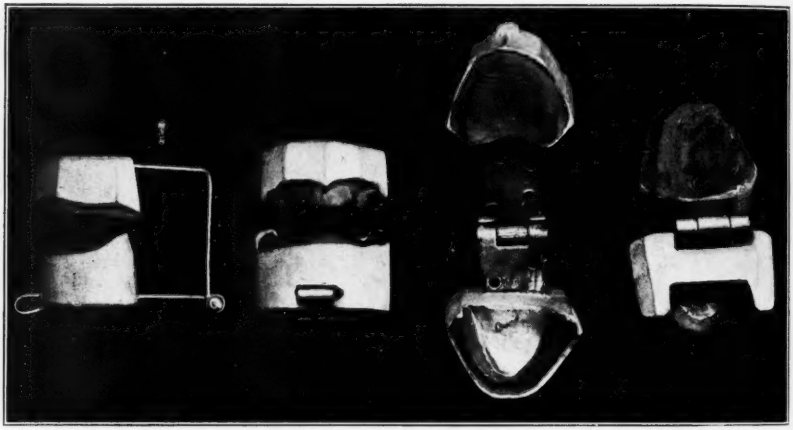

Fig. 4.—Study models.

original occlusion rims ready for mounting. Then, with the face-bow attached, they are mounted on a study articulator made of a 6-inch light strap hinge. A crossbar or intercondylar bar is attached to the hinge to allow the face-bow adaptation. A small sticker, suitably printed, can be fastened to each set of models, the number corresponding with the original chart.

The presentation of interesting data compiled from hundreds of such records will furnish the material for a report sometime in the future.

The practitioner will be repaid in many ways for the additional time and trouble required in this work. In a short time, his ability to detect and analyze conditions, to make an intelligent prognosis and to command the unqualified respect of the patient will place him in an enviable position.

Records carefully kept by a large number of practitioners, following a nearly uniform method of charting will, in a short time, furnish a valuable collection of statistics, and be of inestimable benefit to those engaged in research, and prosthetic dentistry, and to the public requiring such service.

DIET OF PRISONERS AT SAN QUENTIN*

By L. L. STANLEY, M.D., San Francisco, California

IT HAS been possible to know and tabulate all of the foods that have been consumed by the inmates of the California State Prison at San Quentin for the past three years. These lists were taken from the daily menu of the general mess. Although some of the prisoners may not have partaken of all the foods listed, it is positively known that they did not take more or other foods, because the supply is carefully regulated and no food except that on the menu is allowed within the walls.

In the investigation of dental conditions, particularly pyorrhea alveolaris, by a group of research workers consisting of dentists, bacteriologists, chemists and physicians at San Quentin, it was considered part of the work to see what effect a definitely known diet might have on the general health and particularly on the teeth.

This work has been going on for the past three years. The prisoner, on arrival, is given a thorough physical examination and his status at that time is definitely known. Hospital records are made of any hospital admissions or diseases that have developed during this three-year period. The existing physical condition is determined by a reexamination. Here, then, are known: the condition before diet is taken, the diet itself and the physical condition after a period of three years on this diet.

As to the diet, practically all the food is cooked, oranges appearing on the list twice, fresh apples four times, fresh tomatoes thirty times, bananas six times, chow-chow and cole slaw nine times and

*From the California Stomatological Research Group.

*Aided by grants from the Carnegie Corporation, the American Dental Association and Associated Radiograph Laboratories.

TABLE 1.—FOOD SERVED AT THE PRISON MESS FROM JANUARY 1, 1920, TO JANUARY 1, 1923.

		1920	1921	1922	Total
Beverages					
	Tea	294	303	303	900
	Coffee	718	725	771	2214
Bread					
	White	964	1033	907	2904
	Corn	60	97	99	256
	Bran		3	28	31
	Buns	1	31	119	151
	Snails	58	38	20	116
	Coffee cake	1	8	15	24
	Hot biscuit			8	8
Beans					
	Plain	1033	1011	996	3040
	Spanish	67	74	55	196
	Lima	20	18	47	85
	Navy	44	47	52	143
Fruits					
	Stewed peaches	46	45	48	139
	Stewed prunes	50	49	51	150
	Stewed figs	45	32		77
	Sugared figs		16	10	26
	Stewed apples	56	52	50	158
	Oranges	1		1	2
	Fresh apples	1	1	2	4
	Canned peaches	1			1
	Bananas	2	2	2	6
Fish					
	Baked salmon	19	11	12	42
	Baked halibut	5	9	12	26
	Baked rock-cod	1	4	3	8
	Cod-fish cakes	1		1	2
	Cod-fish family style	27	25	25	77
Soups					
	Split pea	19	12	21	52
	Vegetable	4		23	27
	Macaroni	2	4	9	15
	Spaghetti	1	1	8	10
	Pearl barley	18	13	3	34
	Puree of navy bean			15	15
	Vermicelli	22	12	2	36
	Rice-tomato	2	1	1	4
	Noodles		2		2
	Cream of tomato		1		1
Potatoes					
	Steamed	240	229	197	666
	Creamed	10	14	4	28
	Baked	11	9	68	88
	Mashed	5	9	3	17
	Fried		1	9	10
Breakfast foods					
	Corn meal	108	70		178
	Rolled oats	106	95	57	258
	Cracked wheat		22	45	67
Meats					
	Hamburger and brown gravy	153	156	170	479
	Chili con carni	9	9	15	33
	Braised beef	50	51	49	150
	Roast beef and brown gravy	53	64	53	170
	Roast pork	4	3	2	9
	Roast veal and dressing			1	1

		1920	1921	1922	Total
Meats					
	Roast beef hash	34	36	25	95
	Frankfurters and brown gravy	15	11	10	36
	Pork sausage	12	13	14	39
	Boiled beef	3		3	6
	Beef stew	74	95	77	246
	Corn beef and cabbage	8	9	8	25
	Boiled beef and cabbage	9		1	10
	Pigshead and cabbage	4	1		5
	Lamb curry and rice	23	26	12	61
	Lamb stew	3		12	15
	Roast pork hash	2			2
	Beef stew, rice and vegetables	12		24	36
	Beef stew and dumplings		2		2
	Hamburger and Spanish sauce			5	5
	Goulash and beans			2	2
	Hamburger loaf and cabbage			1	1
Vegetables, etc.					
	Boiled rice	14	51	28	93
	Potato salad	1	3		4
	Macaroni salad		3		3
	Spaghetti salad		1		1
	Dumplings (plain)	4			4
	Macaroni and tomatoes	51	20	57	128
	Macaroni and cheese	4	1	23	28
	Spaghetti and tomatoes	41	62	32	135
	Spaghetti and cheese	3	1	13	17
	Vermicelli and tomatoes	1			1
	Macaroni baked	1			1
	Spaghetti baked	1			1
	Fresh tomatoes	8	9	13	30
	Stewed fresh tomatoes	3			3
	Stewed pumpkin	1			1
	Stewed squash			1	1
	Spiced tomatoes		1		1
	Chow chow and cole slaw	2	7		9
	Liberty cabbage		11		11
	Pickled red beets		1	1	2
	Onions		1	1	2
	Creamed carrots		1		1
	Boston baked beans			1	1
	Spanish rice			2	2
	Boiled eggs		1	1	2
Puddings and desserts					
	Apple pie	5	2	5	12
	Apple-raisin pie	2	3		5
	Mince pie	1	1	2	4
	Vanilla cake	1	2	2	5
	Boiled rice, milk and sugar		5	19	24
	Corn starch pudding	3	4	2	9
	Sago and fig pudding	1	4	6	11
	Tapioca		8	20	28
	Rice pudding			15	15
	Creole pudding			2	2
	Cabinet pudding			1	1
	Bread pudding			1	1
	Cheese	2	2	2	6
	Raisins	1		1	2
	Nuts (walnuts and almonds)	1	1	1	3
	Ice cream	1	1	1	3
	Sugar	111	104	103	318
	Syrup	100	102	94	296

fresh onions twice during the whole period of three years.

Butter is not served and is not available. Milk is used in the coffee in bulk about once a week. About 20 gallons of milk is supplied to the mess each day, but this is used for cooking. It is estimated that each of the 2,400 prisoners receives approximately an ounce of milk each day for all purposes.

The meat allowance is ample, and this with the bread and beans forms the principal dietary. Very few of the men complain, and most of them consider the food they receive to be sufficient in quantity. None crave other foods particularly, but they would not be in the least averse to eating many of the dainties that might be provided outside the walls. Eggs and egg products are not served except on Easter, when each man receives a hard boiled egg.

As the vitamins are thought to play a rôle in the maintenance of health, attention was given to this phase of the diet. An effort was made to correlate the quantity and the quality of the vitamins supplied in this diet over a period of three years with the health record at the end of that time.

Various investigators, in working with animals, found that butter fat furnishes a substance indispensable for growth

TABLE 2.—SUMMARY OF DIETARY DURING THREE YEAR PERIOD.

Foods	Times Served
Beverages (tea and coffee)	3,114
Bread (all kinds)	3,490
Beans (all kinds)	3,464
Fruits (fresh and stewed)	563
Fish	155
Soups	196
Potatoes	809
Breakfast foods	503
Meats (plain and stewed with vegetables)	1,428
Vegetables (also vegetable salads and relishes)	483
Puddings and desserts	131
Sugar	318
Syrup	296

TABLE 3.—REPORT ON MEN OBSERVED DURING PERIOD OF THREE YEARS

Age	Weight on Entrance	Present Weight	Cavities Developed
23	159	153	2
21	147	159	7
49	168	180	
35	194	157¼	
65	165	176	
17	150	158½	3
34	147	138½	1
18	149	152½	
23	145	140½	
51	148	154	
25	125	132¼	
23	145	176½	
22	173	193	
48	117	125	
31	135	152	1
65	220	200	
20	139	133	
33	130	120	
20	143	141	
18	147	137	
68	125	124	
19	147	136	
46	169	154	
40	164	143	
41	159	185½	3
35	135	130	
28	175	180¼	
35	146	168½	
21	138	137½	
26	148	135½	
60	234	248	
29	140	158	3
29	124	121	
29	160	158½	2
53	140	129	
46	150	154	
34	160	165	2
22	139	139½	1
19	140	146	
23	165	166	
44	172	169	
36	155	146	
47	134	115¼	
42	178	160½	
20	145	145	
34	155	167	
20	137	137	
34	233	228	4
26	175	165	
20	170	178	1
35	140	141	
23	164	149	4
30	136	135½	
25	145	143	
69	135	132	
22	135	145	1
33	165	176	

and maintenance. This is noted as vitamin A, fat-soluble. Egg yolk fats and cod-liver oil contains this substance. The prison fare is generally deficient in these articles of food and correspondingly so with this vitamin; for, as previously noted, no butter is given, egg products are provided only occasionally and the amount of milk is very small. Corn meal contains vitamin A. Corn bread was served 256 times; corn meal 178 times; or a total of 434 servings in 3,129 meals.

Water soluble vitamin B, the absence of which is thought to cause beriberi in man and polyneuritis in fowls, is probably supplied in sufficient quantities in the prison fare, for no beriberi has been found among the prisoners; at least, it has not been recognized as such. Polished rice is used exclusively. Other foods, such as beans and tomatoes, probably supply a sufficiency of this vitamin.

It is believed that scurvy is caused by a lack of vitamin C. No scurvy has been found among the prisoners at San Quentin. In their diet, tomatoes seem to be the food that might supply this requirement. All the food is cooked; and while it is claimed that the antiscorbutic property is destroyed by heating, with the tomato it has been found that complete destruction of the antiscorbutic properties does not follow cooking.

The accompanying list gives the age, weight on entrance and the present weight of the prisoners, together with the number of cavities which have developed in the teeth during this three-year period. Only fourteen, or 25 per cent, developed caries.

Of the fifty-seven men on this diet, twenty-five gained weight, the weight of two remained stationary and thirty lost weight.

Summary

In three years, 3,129 meals were served.

Vitamin A was supplied probably only in the corn products and the small amount of milk.

Vitamins B and C were probably supplied by beans and tomatoes. With these small amounts of vitamin, the prisoners did as well as the ordinary person would on a much more varied diet richer in vitamins.

A THIRD REPORT ON THE USE OF ETHYLENE-OXYGEN IN DENTISTRY

By J. F. CHRISTIANSEN, D.D.S., Chicago, Illinois

(Read before the American Dental Association, Dallas, Texas, November 10-14, 1924)

IN March, 1924, a preliminary report of clinical experiences in the use of ethylene-oxygen anesthesia in dentistry was published[1] in which was given, briefly, the history of ethylene anesthesia. This report included physiologic experiments with the gas and told briefly of its chemistry and manufacture.

The study and use of this gas was undertaken because it was said to have the advantage of quick induction, with an appreciable amount of oxygen, the absence of excitement, early analgesia, complete relaxation, prompt recovery, absence of tendency to produce acidosis, few after-effects, and safety in administration.

Later,[2] the results of various investigations of the physiology of anesthesia were given, particularly as they related to the use of the combination of gases. Some of these observations were made by me but the majority were made by others. Five cases were cited, illustrating different age groups. Because of the importance of this phase the reports of these cases will be repeated in brief.

1. Christiansen, J. F.: Clinical Experiences with Ethylene-Oxygen Anesthesia in Dentistry, Dent. Cosmos, 66:346 (Aug.) 1924.

2. Christiansen, J. F.: Clinical Experiences with Ethylene-Oxygen Anesthesia in Dentistry, J.A.D.A., 11:720 (Aug.) 1924.

Report of Cases

Case 1.—An 18 months-old child underwent extraction of two upper central teeth. The child was frightened and crying. The induction period lasted about one and one-half minutes (ethylene 100, oxygen 18). The patient was under full anesthesia. Recovery was immediate. In a few minutes the child was playing. There was no nausea and no ill-effects.

Case 2.—A youth, aged 19, typically anemic, malnourished and of pale and pasty color, had two molar roots extracted. He was a little slow in succumbing to the anesthetic. Recovery ensued in about one minute. After a brief rest, the patient left the clinic without any apparent ill-effects.

Case 3.—A man, aged 74, apparently active in his daily life, had ten teeth extracted (ethylene 100; oxygen 10). He took the anesthetic slowly but smoothly. No excitement stage was observed; and the patient felt no weakness whatever from moment of recovery.

Case 4.—A butcher, aged 33, height 5 feet 9 inches, weight 265 pounds, underwent an extraoral operation. Ethylene-oxygen was administered slowly. The pulse remained normal, with no cyanosis. No excitement was observed. The period of anesthesia was seventeen minutes. The anesthetic was discontinued and straight oxygen given to observe recovery period. A noticeable postoperative excitement period without muscular movements lasted a few seconds.

Case 5.—A woman, aged 32, reported being under a physician's care for six years for neuritis; and stated that she had had an abdominal operation six years before and thyroidectomy nine years before. She took no luncheon or breakfast before having five teeth extracted. The pulse was feeble before anesthesia, but of better volume, though with acceleration, as ethylene-oxygen was administered. Slight cyanosis was noted; the skin be-

ing flushed, moist and clammy. Abdominal respiration was present and the pulse was thready. Change in color of the finger nails was observed throughout anesthesia; pale to red to cyanotic. Oxygen administration was increased as follows: 10-28-22 (25 during a short period), during anesthesia. Following operation, the eyes appeared set; the pupils were dilated, then constricted; muscular twitching occurred periodically and symptoms of shock were present. The patient was seemingly in a state of coma for about one-half hour. Spirits of ammonia was administered by inhalation, and the eyes became more set. After recovery, the patient became nauseated, with emesis of bloody liquid. In about one-half hour, she was able to walk, but had very little strength. She reported weakness for two days, but no other ill effects.

Her physician reports that the patient is under his observation weekly, for neuritis. As far as he knew, there is no reason why she should not be able to take ethylene as well as any other patient.

Indications for Ethylene-Oxygen Anesthesia

From the experiences of many, including my own, there appear to be no contraindications to the use of ethylene-oxygen as an anesthetic. The choice of an anesthetic is frequently of concern, especially in the case of elderly people. Ethylene-oxygen is being used in cases in which the presence of functional impairment is certainly known, both in the old and the young. "Cases of pulmonary, cardiac, vascular and renal pathology require an anesthetic which will neither predispose to pneumonia, cripple the action of the heart; produce a dangerous blood pressure or suppress the urinary secretions." From well authenticated cases, including the foregoing conditions, it is believed ethylene-oxygen is the anesthetic of choice in these conditions. In other words, no deleterious effects have so far been recorded which preclude this form of anesthesia as safe, simple and non-irritating.

Action of Ethylene-Oxygen

The direct action of ethylene on the central nervous system is apparent. In its administration, the production of side actions or distinctive accessory respiratory movements are rarely noted, especially in the absence of asphyxia or asphyxial factors. With the oxygen dilution of ethylene, concentration in the blood is lowered to a corresponding degree. Comparatively large percentages of oxygen are always used in the administrations of ethylene. In fact, a minimum of 10 per cent oxygen should be used with ethylene in the induction period increasing as anesthesia is established to as much more oxygen as the patient will take and the degree of anesthesia required for the operation be maintained.

If one is to judge from the comparatively serene condition of the patient under the influence of ethylene-oxygen anesthesia and the relaxation of the musculature, the basal metabolic processes of the tissues are low. Consequently, the body endures on a minimum of oxygen for functional processes.

An important feature of ethylene-oxygen among gas anesthesias is the ability to omit or bridge the second stage of excitement in induction. This feature is, perhaps, a factor in somewhat reducing hemorrhage. It reduces the possibility of anesthetic shock also and reduces the quantity of the anesthetic, shortening and modifying the after-effects.

Reaction of Patients to Gas Anesthesia

In all types of anesthesia, probably respiration furnishes the most important signs. A smooth, regular respiration of good volume and depth, automatic and without noise, is an indication of satisfactory anesthesia. The first action, naturally, of a volatile agent inhaled is on the respiratory system, passing thence to influence the nervous mechanism, the circulatory and the muscular and glandular structures, and finally the complete organism.

Psychic impulses cause early changes in respiration. Fearful, nervous, excit-

able, apprehensive patients usually exhibit short, rapid respiration during induction. Resistant, muscular types react often quite similarly.

Unfavorable signs in gas anesthesia are most conspicuous in the induction period. Much depends on the manner of taking the anesthetic, as well as on the mental attitude of the subject toward anesthesia. Nervous, excitable or fearful patients are often difficult to anesthetize. However, healthy vigorous subjects are not necessarily the safest risks. Phlegmatic, feeble patients usually exhibit less tension, and muscular obstruction, and require less anesthetic. A frightened or nervous patient, irrespective of type, should never be carried hurriedly into anesthesia because the excitement of anesthesia is added to "the preanesthesia excitement, which is thus doubly enforced." This type of patient should receive intelligent premedication if any extensive surgical operation is to be performed.

Depth of Anesthesia

With ethylene-oxygen, deepening anesthesia is first noted by extreme muscular relaxation, especially of the neck and jaw. It appears at times that the body becomes anesthetized regionally but in rather rapid stages. The throat and head may be completely relaxed and the abdominal muscles comparatively rigid. If the respiratory tract is slightly obstructed, the abdominal muscles naturally come forcefully into action and remain tense until the respiratory tract is free and open.

The further deepening of anesthesia is noted by a change in rhythm and amplitude in respiration. In dangerous or profound anesthesia the following symptoms are noted. Expiration may be longer than inspiration and more labored. The color changes to livid or bluish about the lips and face, and the pupils may dilate. The color of the blood and freer bleeding in the wound may denote concentration of the vapor in the body. There may be seen a "gathering expression" or lack of expression over the entire face; body temperature falls noticeably; the patient's face becomes grayish; the hands may take on a deathlike pallor (not cyanosis); respirations become shallow; the eyeballs are fixed and dry; and the eyelids are separated. These conditions indicate that the organism must have more oxygen, and this, of course, applies equally to nitrous oxid-oxygen anesthesia. We all know oxygen is the antidote for both nitrous oxid and ethylene. We also recognize that surgery does not require that the patients be carried to these extreme stages of anesthesia. No surgical operations demand this depth of anesthesia.

In the early stages, or induction period, of gas anesthesia, breathing usually is slightly faster than the normal rate of breathing for the type of patient. One must recognize the type of subject. Rate of breathing is best controlled by means of "rebreathing." "Rebreathing" is used more frequently with the anemic type and less frequently, if at all, with the muscular types.

It is always the better plan to maintain as light an anesthesia as possible, securing only the depth necessary for operation. Depth of anesthesia is largely controlled by the amount of oxygen in the mixture. One should always give the patient as much oxygen as possible. After anesthesia is established, it may frequently be maintained with an increase of oxygen up to or beyond 20 per cent and a decreasing volume of the anesthetic. If uncertainty as to depth of anesthesia exists, oxygen may be supplied or the anesthetic discontinued until familiar safety signs are in evidence. The proper proportions of the gas mixtures given the patient should be determined as early as possible by the anesthetist. An evenly maintained mixture means a smooth and even anesthesia.

Ethylene certainly must not be ad-

ministered without oxygen. It is a most powerful muscular relaxant. Without a proper percentage of oxygen, the patient may be carried rapidly into a dangerous state of relaxation almost without warning.

Technic of Administration for Dental Surgery

Position of Patient.—The patient is placed in the dental chair, which is tipped so as to approximate a reclining position. The head and neck are kept in line with the body, the usual position for the administration of a general anesthetic in the dental office.

Apparatus.—The gas machine is set to deliver not less than 10 per cent oxygen and 100 per cent ethylene, the total flow not to exceed the normal tidal wave of the patient. The "bite block" or "prop" is inserted in the mouth over the molar-bicuspid teeth, the mouth being opened as far as possible without discomfort to the patient.

The gas machine is now turned on to deliver the mixture as above mentioned—10 per cent oxygen and 100 per cent ethylene. The nasal inhaler is placed to make an air-tight contact with the face. During the first minute, the nasal inhaler exhaling valve is opened slightly to prevent a lung pressure in the early stage of analgesia. The mouth is covered after about six inhalations of the gas mixture. The mouth covering is so placed that no air or anesthetic mixture is permitted to enter through the mouth. Nose breathing is now established and is maintained exclusively to the end of the operation.

The exhaling valve of the nose piece is closed during the first minute of administration. This causes a slight pressure of the established mixture to accumulate in the bag and in the patient's lungs. The pressure thus secured produces a deep anesthesia without decreasing the safety margin of 10 per cent of oxygen or increasing the rate of flow of the mixture.

Signs of Anesthesia.—The approaching signs of anesthesia are not entirely different from those of nitrous oxid-oxygen. However, there is an almost complete absence of the excitement period even in the muscular type of patient. Pupillary reaction, either of dilation or constriction, is seldom noted. The eyeball may roll or oscillate, but it generally assumes the usual anesthetic state when complete anesthesia is established. The mechanical breathing, color, and reflexes, together with relaxation required, are guides for use.

In normal anesthesia under ethylene-oxygen, the indications are as follows: 1. Respirations: regular, deep, automatic. 2. Muscles of extremities lax. 3. Eyelid relaxed. 4. Pupillary reaction to light: pupil small; eyeball quiet. 5. Ears, lips, face of normal color.

Any anesthesia accompanied by cyanosis is dangerous. One should remember that cyanosis of the skin means cyanosis of other body tissues. Although the mechanism of the production of cyanosis is not wholly understood, cyanosis is accepted quite generally as an evidence of partial asphyxiation, and in this sense represents a general rather than a local condition. Cyanosis, therefore, is quite generally associated with all the undesirable effects of asphyxiation; notably, rigidity, muscular activity (accessory respiratory movements), increased blood pressure and profuse perspiration. It appears, therefore, that the ethylene-oxygen mixture produces anesthesia without any of these undesirable complications because of the abundant oxygenation of the tissues at all stages of the anesthesia, coupled with the anesthetic effect of the gas. Even in the hands of the most skilful operators, the same effects cannot uniformly be produced with nitrous oxid-oxygen without resorting to the use of nitrous oxid momentarily crowded to

the point of saturation, and if necessary repeated.

Surely, partial asphyxiation is not desired in patients who are diabetic or who have an elevated blood pressure with arteriosclerosis. According to Gwathmey "any anesthesia accompanied by cyanosis is dangerous and deaths have not been reported with N_2O in which the patient's color was maintained pink." Ethylene-oxygen, when properly administered, need never be pushed to the point of cyanosis in order to obtain analgesia or anesthesia with complete muscular relaxation. Cyanosis is not present in normal anesthesia.

When the eyelids respond sluggishly to touch, the patient is ready for the mouth pack.

The Mouth Pack. — An air-tight mouth pack is essential in maintaining this type of anesthesia, in prolonged as well as brief operative periods. It is as important in nitrous oxid-oxygen anesthesia as it is in the administration of ethylene-oxygen.

The main pack consists of a large roll of absorbent cotton to which a long string is firmly attached. It is rolled into the mouth over the tongue, up against the hard palate and back toward the soft palate. The sides of the cotton pack are pushed toward the angles of the jaw and a gauze strip is laid along and over the side of cotton to prevent the cotton fibers from adhering to the instruments or fingers of the operator. This part of the technic requires only a few moments, and one is amply repaid because of its assistance in excluding air from the carefully measured anesthetic mixture. In addition, the pack in the mouth prevents blood and secretions from entering the throat and stomach of the patient—a frequent cause of postoperative nausea. It furthermore prevents accidental aspiration of roots or pieces of teeth into the trachea and bronchi. The packing of the mouth may possibly depress the mandible, necessitating its elevation to correct position.

The muscles of the mandible seemingly are not very strongly set during the anesthesia period. The mouth may be opened to rearrange the "prop" or change its position, with only a slight pull of the fingers in fairly deeply anesthetized subjects. It seems that ethylene-oxygen is a smoother and more powerful anesthetic agent than nitrous oxid-oxygen.

Rapidity of Action.—Ethylene-oxygen is more rapid in its action than nitrous oxid-oxygen. When the time was actually noted, our experience confirms the report of Luckhardt and Carter that anesthesia by ethylene-oxygen may be produced in considerably less time than is required for the same degree of anesthesia under nitrous oxid-oxygen.

The length of the induction period varies slightly with individuals. The phlegmatic or calm type sometimes shows signs of anesthesia within thirty seconds. In fact, just six or eight inhalations are frequently sufficient to produce analgesia. In the nervous, high-strung patient, from sixty to seventy seconds may be required to secure the same degree of analgesia. A usual test of the sluggish eyelid, together with the relaxation of the muscles of the body, is in all types of patients evidence of anesthesia.

A marked period of analgesia is noticed as early as after thirty seconds in some patients. We have not observed pharyngeal reflexes or swallowing in this period. It seems that the patient exhibits a sense of quiet and well-being. With the exception of a few cases, there has been no sign of struggling or resistance after the administration of the anesthetic was commenced. Loss of consciousness promptly intervenes. There are few very definite signs by which one may note the progress toward anesthesia. In some cases, it seems that the musculature is more re-

laxed after a few inhalations of the ethylene-oxygen mixture than just before the anesthetic period. If the fingers of the patient were clasped prior to the induction period, they may be easily unclasped when the induction period is completed.

Respiration.—Apparently, under ethylene-oxygen, there is not the stimulated, labored respiration frequently observed under nitrous oxid-oxygen. It is more like the normal respiration, seen in natural sleep. A slowing, shallow respiration means too deep an anesthesia. This is corrected by reducing the flow of ethylene or temporarily increasing the oxygen. In cases of anesthesia requiring more than five minutes, the oxygen flow may frequently be increased to 20 per cent or more, without producing too light an anesthesia or producing notable changes in respiration.

Blood Pressure

Observations and records of blood pressure before induction, during the operative period and during the recovery period were made in a few of the clinical cases. There appeared a slight depression of blood pressure in rather deeply anesthetized patients, but no change in the lighter anesthesias. Certainly, the number of tests do not warrant definite statements relative to variations in blood pressure.

The Skin

Color.—Usually, the skin is pinkish during the anesthesia period. This brightening effect may be due to the dilation of the minute capillaries or, as has been suggested, it may mean ethylenated blood, due to a weak combination of ethylene with hemoglobin. The pinkness of the skin usually remains during the anesthesia, and for a short time after recovery. In some patients, an exhilaration at recovery is apparent, but never, so far, have we had an extreme case of exhilaration, expressed in the form of forced or violent muscular movements.

Sweating.—With the usual or favorable, type of patient, there is an absence of perspiration on the face or the forehead. The skin is dry and warm. With the muscular and anemic types, sweating has been noticed. The glands of the mouth are not stimulated excessively, according to observations.

Postoperative Effects

With ethylene-oxygen, there is a very narrow margin between anesthesia and consciousness. It is interesting to note the narrow margin. Patients pass rapidly from the anesthetic to the waking stage. Several patients have answered rationally in less than two minutes after removal of the inhaling mask. A brief period may elapse before the patients regain perfect muscular control. They appear weak and rather limp and unsteady of gait, and usually need a short period of rest. Possibly the delay of muscular control beyond the conscious period is an advantage in eliminating a postanesthetic excitement period.

Nausea occurs in from 12 to 20 per cent of cases. There is a variation from "feeling nauseated" to vomiting or emesis. The cause of vomiting is not clear. It may be from impurities in the ethylene or from the ethylene itself, but impurities contribute to the production of nausea. It appears that the employment of different tanks of ethylene makes a variation in the number of cases of nausea. The purer the ethylene, the fewer cases of nausea, regardless of the patient or character of the operation. A tank that produces vomiting will also readily produce cyanosis in spite of high percentage of oxygen given in administration. Impurities in the ethylene are probably the principal cause of many of the cases of nausea. According to several authorities "the bad after effects of general anesthesia are accounted for by the changed metabolism in general; probably resembling the altered metabolism as in diabetes, a disturbance of the nor-

mal oxidation processes being responsible.

Vomiting during anesthesia occurs only in lightly anesthetized patients and is often an indication of excessive rebreathing for that particular patient. Nausea or vomiting depends on many things besides the anesthetic agent. Perhaps in the discussion we may be given information that will determine more definitely the causes of vomiting in gas anesthesias. In ethylene-oxygen anesthesia there have been no serious or unduly prolonged cases of vomiting. In two reported cases, there was sickness after the patients were dismissed from the clinic.

Disadvantages

Odor.—Ethylene has not a pleasant odor. Perhaps it may be likened to ether as to its distinctive odor. No patient complained of the pungency or odor.

Oozing.—Perhaps there is more hemorrhage from the sockets of extracted teeth than under a local anesthetic or nitrous oxid and oxygen. The bleeding has never been serious, and the tendency to oozing stops on removal of the anesthetic. Cases reported from other sources, in which blood coagulation tests were made before, during and after administration of the anesthetic, indicate no change in coagulation time owing to the presence of ethylene.

Inflammability.—Ethylene mixed with air or oxygen, in certain definite proportions, is highly explosive. Authorities assert that it is not quite so inflammable as ether vapor. No open flame or any source of electrical discharge should be permitted or used near ethylene. The operating room should always be well ventilated during administration. This point must be constantly in mind.

Freezing.—Machines are more easily frosted in the use of ethylene and oxygen than with nitrous oxid and oxygen, owing no doubt, to the high water content of gas in its manufacture. Ethylene is highly combustible. Therefore, electrical or alcohol heaters should not be attached. If necessary, a hot water bottle or hot wet towels may be placed on the tank heads and regulators during administration.

Advantages

The advantages of ethylene-oxygen anesthesia are:

1. (*a*) The ease of induction, and the narrow margin from the anesthetic to the waking stage; (*b*) the quick recovery. (In many cases wakefulness occurs almost as soon as the mask is removed.)
2. The wide margin of safety because of the high percentage of oxygen possible in the anesthetic mixture. As administration of the anesthetic is continued beyond the induction period, oxygen may be increased to 15 or 20 per cent or more. Twenty per cent equals the amount of oxygen in the air or the normal amount of oxygen required for the physiologic body functions.
3. (a) Relaxation of musculature quickly and surely secured without cyanosis; (*b*) absence of cyanosis.
4. Absence of respiratory irritation.
5. Absence of the marked excitement period, during induction.
6. Absence of excessive sweating, avoiding dangers from quick cooling after recovery.
7. Ease of maintenance of anesthesia.
8. Absence of postanesthesia excitement period.
9. Low percentage of nausea.
10. Absence of postoperative disturbances, such as loss of appetite, headache and sleeplessness.
11. No impairment of the functions of any organ in the body.

Ethylene

Previous to Dr. Luckhardt's clinical reports on ethylene anesthesia, the use of this gas was confined solely to welding and cutting and other industrial

purposes. Its degree of purity for industrial usage was of no great importance. Since Luckhardt's report, the manufacturers have tried to produce an ethylene of a quality that would be suitable for anesthesia. Manufacturers are constantly at work endeavoring to find the means of removing the objectionable impurities, making ethylene safer for anesthesia. Since July, 1924, one manufacturer has announced an improved quality of ethylene. The pungent odor has been reduced greatly. Oils and other foreign substances also have been removed, making the gas free flowing and thus eliminating freezing. The improved ethylene has been noticed by many anesthetists who have reported that workers and surgeons in the operating room have noticed the odor less, patients have been less nauseated and quicker recovery has been apparent. Whether absolute ethylene is entirely odorless is open to discussion. Brown's report on explosibility probably gives us as much information as is favorable at the present time. Constant efforts are being made by the manufacturers further to improve the quality of ethylene, and clinical reports subsequent to July 15, 1924, show that wonderful strides have been made.

Discussion

James G. Poe, Dallas, Texas: My discussion of this subject is not so apt because our work is with hospital cases principally. Therefore, we have different conditions under which to operate.

One of the most important points brought out is the safety of this anesthetic because of the opportunity for increased oxygenation. When a patient is deoxygenated, the harm resulting is reflected in many ways. The patient who has myocarditis probably has increased blood pressure and degeneration of the arteries, and when he becomes cyanotic he is exposed to the extreme dangers of dilatation of the heart from the accumulation of the venous blood and also to apoplexy and that line of troubles. Therefore, we hail ethylene as a great adjunct to our anesthetic agents. We can use more oxygen and therefore avoid one of the great dangers of anesthesia: asphyxia, a prominent symptom of overdose of the gas anesthetics that are administered with oxygen, which is necessary because none of them, while they have oxygen chemically, that is nitrous oxid, has oxygen within, and so gives none of it to the body. There is no breaking up of nitrous oxid. The patient gets only the oxygen that is administered to him. Therefore, we have to deal with this type of anesthetic by giving the oxygen, and with the greater margin, the greater power of the anesthetic and the greater content of oxygen we can give, as I said before, the safer the anesthesia becomes.

In the hospital, we can use premedication. With office cases, premedication is not employed. Dr. Christiansen's experience is of great importance in that line, which is, as I have said different from ours. I fear that we don't always examine our office patients as thoroughly as they should be examined. There are some very simple tests that will give you an idea of the dangers that you may get into that I might mention.

The holding the breath test is very simple, and if you find that your patient can't hold his breath more than ten or twenty seconds after letting him take a good inspiration, you had better postpone the operation and refer him to the internist to find what the trouble is. If the patient is a diabetic you will find it out in that way. You will find a great many other things in that way, such as the presence of a decompensating heart.

Maxwell C. Murphy, Sherman, Texas: Ethylene has been my hobby for some time and I am glad that one of the first men in the country to use it was a dentist. Dr. Christiansen was, I think, the first dentist to use it. At least, he was the first dentist to do any considerable amount of research work with it. It is well that he and Dr. Poe brought out the subject of safety. Ethylene oxygen is, in my opinion, one of the safest anesthetics we have. In fact, we have found no contraindications for its use. We have used this anesthetic on patients from 18 months of age to 90 years, for a period from five minutes to three hours and a half. We have used ethylene on patients that have had every contraindication for the usual general anesthetic, such as fibrillating hearts, highly toxic goiters and diabetes.

One case in particular that illustrates the advantages of ethylene anesthesia was that of a child 18 months old. The baby had had pneumonia, the crisis having past three days before. In trying to aspirate fluid from its chest, the physician had broken the needle off, and he thought it necessary to remove it. We gave the baby ethylene for a little more than thirty minutes. Naturally, it had a bad pulse during the administration, but there was no other ill-effect. The baby awoke immediately, was not at all nauseated, got entirely

well and is living now. I think the case is very unusual. I believe that it could not have been successfully handled with ether, and I doubt that nitrous oxid could have been used with success.

Ethylene is inflammable, as Dr. Christiansen and Dr. Poe have said, and one should consider that in its use. I believe that is the only real danger. Of course, the danger of explosion is greater in certain percentages with oxygen. One would not use these percentages in anesthesia. If you watch the bag and pay attention to your anesthetic, be careful that there is no open flame, no cautery nor other electrical appliance, I believe the danger of explosion is negligible. I think ethylene is here to replace nitrous oxid and I believe that it is the anesthetic of choice.

Roy S. Hopkinson, Milwaukee, Wis.: The inflammability of ethylene is admitted, but that is not the most serious objection to this anesthetic. It has been the experience in cases up to the present time at least, and I keep in pretty close touch with the literature, that the duration of analgesia, which is the first stage and which with an anesthetic of that type happens to be the postoperative stage, is of longer duration than with nitrous oxid and oxygen. I will grant that the man who uses nitrous oxid sometimes has a long period of depression after he removes the mask. Oxygen is not an emergency remedy: it is just as essential a part of an anesthetic as the anesthetic agent itself. Those who use it as they do epinephrin, camphor and oil, strychnin and artificial respiration, are the men who don't like it and who get into trouble with nitrous oxid and oxygen. I can't feel as Dr. Christiansen does on the limited experience that he must have had and that every other man in the country has had up to the present time, that the definite statements about its safety can be borne out in any other way except by thousands of clinical cases. Statistics vary in the hands of different men, and 10,000 anesthesias are a small number to determine the safety of a new anesthetic. We should all proceed rather carefully in our enthusiasm over a new anesthetic. The sad part of it is that there are general practitioners taking up ethylene who have never given nitrous oxid and oxygen or any other anesthetics, and they are told about these machines that Dr. Christiansen spoke of that have figures on them that don't mean a thing so far as the patient is concerned. If a man can't read symptomatology, he can't give an anesthetic, and never should.

I feel that a word of caution from those who have handled the anesthetics for a good many years should be given out to the profession until men like Dr. Christiansen, Dr. Poe, Dr. Murphy and many others have compiled records of sufficient number to give us data that are not only scientific but will convince us of the statements that they have made.

Dr. Christiansen (closing): We don't need or use much pressure with ethylene. There is no netting on the bag we use; the rubber tubing has no metal arrangement whereby the pressure of gases even approaches a serious degree.

We do use some pressure, but it is slight rather than great. A definite smooth anesthesia is usually secured by an even dosage of the anesthetic. Percentages of the gases should be secured, observed and rated by the man who administers the anesthetic. He should know symptomatology. I still think this is the most accurate way to administer anesthetics.

Ethylene is said to be very inflammable. Tests are being made now, relative to explosion possibilities. Dr. Brown of Toronto was one of the first to make them. The United States Bureau of Explosives reports ethylene with air as of one-half the range of ether vapor.

We must observe the advice of our elders with reference to explosiveness. The anesthetist should not take unnecessary chances with as good an anesthetic agent as ethylene. I am not frightened about ethylene so far as its explosiveness is concerned. Nearly all gases will explode, and ethylene among them is, perhaps, one of the most explosive. Records of thousands of administrations prove ethylene-oxygen a most valuable anesthetic agent. It merits attention and study by our profession.

Dr. Hopkinson speaks of safety of ethylene as compared to nitrous oxid. In the hundreds of thousands of cases in which nitrous oxid has been given, it certainly has proved its worth. Ethylene is comparatively new. I don't know that ethylene will ever displace nitrous oxid. I like ethylene oxygen as an anesthetic for the certain ease of maintenance and other desirable attributes spoken of. I am not here to condemn or compare nitrous oxid particularly with ethylene, but I do think ethylene oxygen is a stronger, more powerful and smoother anesthetic agent than nitrous oxid-oxygen.

THE CYTOLOGY OF ENDAMOEBA GINGIVALIS (GROS) BRUMPT COMPARED WITH THAT OF E. DYSENTERIAE WITH SPECIAL REFERENCE TO THE DETERMINATION OF THE AMOEBAS IN BONE MARROW IN ARTHRITIS DEFORMANS OF ELY'S SECOND TYPE*

By CHARLES A. KOFOID and OLIVE SWEZY, Berkeley, California

Introduction

THE tissue invasive potentialities of *Endamoeba dysenteriae* suggested the occurrences of liver, lung, and brain abscesses of amoebic origin, have been further supported by the findings of Engman and Heithaus (1919) of amoebas in ulcers of the skin, since verified by us in their material and in one additional case, and by the discovery of amoebas in the testis by Warthin (1922) and in the semen by Hines (1923). Additional evidence indicative of the agency of the blood stream in the distribution of this species is offered in our findings (Kofoid and Swezy, 1922*a, b, c;* Kofoid, Swezy, and Boyers, 1922*a, b;* Kofoid, Boyers, and Swezy, 1922*a, b;* Kofoid, 1923) of E. dysenteriae in the bone marrow in cases of arthritis deformans of Ely's second type and in the inguinal gland in Hodgkin's disease. The relation of amoebiasis to iritis reported by Mills (1923) is of interest in this connection.

The apparent clinical relation between diseased teeth and arthritis and the occurrence of amoebas in the gums coupled with the conflicting opinions as to the occurrence of more than one species of amoeba in the mouth and tonsils, and the clinical reports of amoebas in malar abscesses, call for precision in the identification of the species of amoeba of the buccal and adjacent regions. This need is accentuated by the well-known resemblance of *Endamoeba gingivalis* of the mouth to *E. dysenteriae* of the colon in the matter of clear pseudopodia. In like manner the contested reports that *E. gingivalis,* as well as *E. dysenteriae,* ingests erythrocytes, and Dobell's (1919) atypical figures of nuclei of *E. gingivalis* strikingly resembling those of *E. dysenteriae,* add to the confusion, and to the desirability that investigations should establish more clearly the diagnostic differences between these two species and determine their local distribution in and their respective relations to pathological conditions in the buccal, tonsilar, and malar regions of man. The present unsatisfactory state of our knowledge on these matters is reflected in the cautious statements of Fischer and Yü (1918) in their discus-

*Owing to lack of space, this article has been abbreviated by omission of the bibliography.

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sion of the amoeba of the oral region, and in the lack of evidence for Dobell's (1919) rather hesitant allocations of the amoebas included in his discussion of *E. gingivalis*.

The amoeba of the gums and tonsils of man acquired a temporary increase of interest about 1916 because of its supposed relation to pyorrhea alveolaris or Rigg's disease. This notoriety lapsed with the failure of treatment by emetin to relieve the symptoms permanently, or to destroy the organisms or prevent the recurrence of the amoebic infection about the teeth. A final decision as to the relation of this amoeba to pyorrhea may well be deferred until more extensive, critical experimental work has not only determined its relations, if any exist, to pathological conditions in the buccopharyngeal region, but has also discovered a successful treatment for the infection.

We have undertaken an investigation of *Endamoeba gingivalis* because of the possibility that it might enter the tissues or blood stream, localize in bone marrow, or otherwise become involved in the complex which results in some of the forms of arthritis. There is some morphological and some clinical evidence of a relationship of amoebas to Ely's (1920) second type of arthritis deformans; it is therefore a matter of clinical significance to determine whether or not *Endamoeba dysenteriae* is the only species concerned in this condition.

Since the species of amoebas are differentiated mainly and most decisively by cytological details, it is important that these features of the amoeba, or amoebas, of the buccopharyngeal region be clearly established. We accordingly present herewith the results of a renewed study of amoebas from about twenty different cases of oral infection, and portray the characteristic nuclear structures which enable one to distinguish this amoeba from *E. dysenteriae*.

ACKNOWLEDGMENTS

We are deeply indebted to Dr. L. W. Ely, of Stanford University Medical School, for his cooperation in supplying us with a portion of an excised head of a femur fixed on excision in formalin, and for a celloidin section prepared from the same specimen. This material came from case 187 of his second type of arthritis deformans (Ely, 1920). His courtesy has made possible a critical comparison of the amoebas of the bone marrow in his second type of arthritis with those of the buccal, or more specifically of the gingival region.

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MORPHOLOGY

The Motile Phase

Endamoeba gingivalis has been found by us thus far only in the motile stages. The reports of Chiavaro (1914), Smith and Barrett (1915), Craig (1916) and Nowlin (1917*a*) of the finding of cysts appear to us to be erroneously based upon rounded-up individuals in which the ectoplasm is not demonstrable, or not readily seen, or in which it has been reduced to a film superficially resembling a cyst wall, but not forming one. We find no evidence for agreement with Goodrich and Moseley (1916) that Craig's cysts are those of a water amoeba.

The *motile phases* may be studied in activity on the warm stage for an hour or more in physiological salt solution, or better yet in saliva. Along the line of contact of the salt solution with iodine-eosin, the pseudopodia are fixed in normal contour with little or no contraction. Examinations of freshly made smears reveal many contracted individ-

uals and others with numerous small pseudopodia. Emergence from these conditions into seemingly normal activity with single or few large pseudopodia can be followed on the controlled warm stage. There is abundant evidence of a great variety of appearances of the pseudopodia in response to conditions of shock, temperature, and possibly of changes in pH. Smears fixed under different conditions reveal differences in number, shape, and extent of pseudopodia, and in the sharpness of delimitation of ectoplasm and endoplasm. Smears from the same region of the gums may exhibit, in different slides, marked differences in the relative extent of the ectoplasm due to some undetermined factor. These differences may have been the occasion for the concept of more than one species of amoeba in the mouth, resulting in the description of *E. pyogenes* Verdun and Bruyant (1907), *E. Confusa* Craig (1916), and *E. macrohyalina* Tibaldi (1920). The contractile vacuole reported by Tibaldi may have been only a discharging food vacuole.

ECTOPLASM

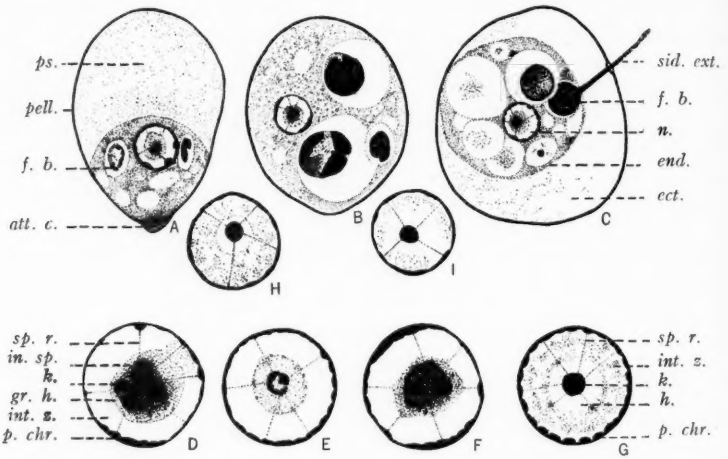
When in locomotion *Endamoeba gingivalis* normally exhibits both in life and in stained preparations a division of its substance into a clear, peripheral ectoplasmic zone and a granular, more deeply staining endoplasm containing food vacuoles and nucleus. In life the ectoplasm is crystal clear and hyaline. In material stained in Giemsa the ectoplasm retains a bluish tinge and rarely shows differentiation. In iron-haematoxylin it generally shows a clear margin and a very faintly granular and alveolar central area (pl. 16, Figs. 17-19). This area is sharply differentiated from that of the granular endoplasm, which is more deeply stained, with darker and coarser granules. The line of demarcation between ectoplasm and endoplasm is, as a rule both in life and after staining, sharply delimited, but there are amoebas in which the transition is somewhat graduated (pl. 16, Fig. 17). Others, in the non-motile phase, may exhibit no ectoplasm at all (pl. 15, Figs. 8-11). The sharpness of the delimitation between ectoplasm and endoplasm can be seen only in transverse optical section. Focus at tangential levels obscures it.

Moribund amoebas are evidently not uncommon as is shown by absence of food vacuoles, abnormal vacuolation, and loss of stainability of the nucleus (pl. 15, Fig. 14). There are, however, seemingly normal amoebas exhibiting none of these conditions in which no peripheral ectoplasm can be differentiated. The normally constituted endoplasm in such amoebas extends to the pellicle. It seems that under certain conditions the endoplasm may normally invade and intermingle with apparently the entire ectoplasmic region except the pellicle. Craig (1916, pl. 6, Figs. 9-12) has described some of these individuals when freed from vacuoles and rounded up as precystic and cystic forms. The evidence for his conclusion is unconvincing, beyond the analogy that *E. dysenteriae* in precystic and cystic stages frees itself from vacuoles and no longer shows an ectoplasmic region. We find no evidence that these stages form cyst walls, glycogen vacuoles, and chromatoidal bodies, and then pass through mitoses as in the formation of cysts of *E. dysenteriae*. Feeding and metabolism are evidently slowed down, possibly as in depression periods in *Paramecium*. If so, death, or recovery of normal activities, is the alternative.

The relative amount of the ectoplasmic territory in active amoebas may be large. In a slide full of amoebas in pseudopodial activity in a rounded-up individual free from food vacuoles with a clear ectoplasmic zone 2.7 microns thick and a total diameter of 18 microns, the ectoplasm formed 55 per cent of the volume. In most cases the relative volume of the ectoplasm is much smaller.

A striking characteristic which seems hitherto to have been wholly overlooked

is the *ectoplasmic pellicle* (Fig. A, *pell.*) which may be found in practically all individuals when properly stained in iron-haematoxylin and erythrosin. It is a thin, homogeneous, more deeply stained surface film, uniform in thickness in the iron-haematoxylin alone, while in the counterstain it stains more deeply pinkish than the underlying ectoplasm. It covers the entire surface uniformly, including the pseudopodia, and appears on individuals showing no other ectoplasm. It is evident only in optical transection and disappears in tangential focus. We can find no such structure in *E. dysenteriae* in the motile phase.



Figs. A—F. *Endamoeba gingivalis* (Gros, 1849) Brumpt, 1913, from smears of gingival exudate fixed in Schaudinn's fluid and stained in iron-haematoxylin. Camera lucida drawings, Figures A—C×1750; Figures D—F×3500. Abbreviations: *att. c.*, attachment cone; *ect.*, ectoplasm; *end.*, endoplasm; *f. b.*, food body; *gr. h.*, granular halo; *h.*, halo; *int. z.*, *intermediate* zone; *k.*, karyosome; *n.*, nucleus; *p. chr.*, peripheral chromatin; *pell.*, pellicle; *ps.*, pseudopodium; *sid. ex.*, siderophile extrusion; *sp. r.*, spoke radii.

Fig. A. Motile amoeba with single pseudopodium and posterior attachment cone. Figure B. Rounded-up amoeba with no ectoplasm, three food vacuoles, one with a lymphocyte and one with a polymorphonuclear leucocyte. Figure C. Rounding-up individual with large amount of ectoplasm, food vacuoles with leucocytes or remnants of them. The siderophile contents are being extruded as a viscous strand through the ectoplasm and a stained ring in the pellicle. The outer end is disintegrating.

Fig. D. Nucleus with clustered karyosomal granules, in a darker central region, distinct granular halo, and irregular peripheral chromatin. Figure E. Heavily destained nucleus with more regular peripheral chromatin, granular peripheral ring about the halo, two small karyosomal granules in a darker central region. Figure F. Not heavily destained, irregular peripheral chromatin, three karyosomal granules in darker central area.

Figs. G—I. *Endamoeba dysenteriae* (Councilman and Lafleur×3500. Figure G. Nucleus from motile amoeba in human stool. Note clear halo and granular intermediate zone. The halo in Figure G is exceptionally large and its chromatin less regular than usual. Figures H and I. From motile amoebas in human bone marrow in the excised head of the femur fixed in formalin, but later refixed in Schaudinn's fluid, decalcified, and stained in iron-haematoxylin, from Ely's case 187 of arthritis deformans. The halo is difficult to demonstrate in these amoebae and is generally small, or absent as in Figure I.

Pseudopodia and Locomotion

The *pseudopodia* of *E. gingivalis* vary in size, number, and shape. They often have only a single large pseudopodium (Fig. A; pl. 14, Figs. 2, 3, 5) whose base is 0.5 to 0.9 the diameter of the body, and whose length only occasionally exceeds the width of the base. They are usually symmetrically rounded in outline but when fully formed may become inflated distally (Fig. A; pl. 14, Figs. 1, 3) or slightly asymmetrical. During pseudopodial activity the pseudopodia may be formed in such rapid succession that two to five are in process of formation or retraction at one time.

Active locomotion in one direction is accomplished by the repeated formation of pseudopodia in one region in rapid succession. One amoeba, 20 microns in length, was observed to traverse a microscopic field, and turn and retraverse it, a total distance of 386 microns in eight and one-half minutes. This amoeba had been freshly mounted in saliva but had not been placed on a warm stage. The formation of pseudopodia may continue in rapid succession with no locomotion at all. One amoeba while almost stationary thrust out twenty-four successive pseudopodia in two minutes. No conclusive evidence of a permanent polarization has been found by us. Prolonged locomotion in a single direction can often be seen and repeated successive formation of pseudopodia at or near one pole, with an approximation of equality in the number of pseudopodia formed at the right and left which might suggest polarity and a spiral organization and behavior; but this is frequently interrupted, perhaps by a motor reaction. These interruptions taken in connection with the not infrequent total reversal of the direction of locomotion make it difficult to posit either permanent polarity or a spiral organization in this amoeba, such as Schaefer (1923) has detected in free-living amoebas. The occasional adhesiveness of the posterior end suggests an attachment cone (*att. c.*, Fig. A; pl. 15, Fig. 6).

Amoebas freshly mounted in physiological salt solution may show very many small pseudopodia, sometimes clustered (pl. 14, Fig. 1), possibly in the period of recovery from shock. The single pseudopodium—or at the most two or three—of the broad, symmetrically rounded type, rarely very much longer than the width of the base, seems to be the normal form both in locomotion and in the stationary phase. It is very often found in smears in saliva that have been allowed to stand for a short time before fixation.

The pseudopodium is formed by localized solation followed by sudden spread of the area and abrupt expulsion of the liquefied ectoplasm, which gels suddenly when the pseudopodium has been completed. There is no corresponding abruptness in the movement of the endoplasm. We can find no evidence of any constancy in the position of the nucleus with relation to the area of origin of the pseudopodia or to the direction of locomotion. It is detected and followed with difficulty in life and is found in the widest possible range of location in fixed amoebas, though, in the majority of instances, it is subcentral.

Endoplasm

The *endoplasm* is rather coarsely alveolar and more often than not in normal individuals is crowded with food vacuoles (pl. 16, Fig. 15). In life it is sharply delimited from the very hyaline ectoplasm by its granular composition and food vacuoles, both of which are even more clearly demonstrated by the staining process. The living endoplasm is very mobile, as is indicated by the shifting of food vacuoles and of the nucleus as well as by its adjustments to pseudopodial formation and to locomotion. It may fill the entire body out to the ectoplasmic pellicle, seeming to obliterate the ectoplasm, especially in rounded-up and possibly also in mori-

bund individuals. In other amoebas with normal food vacuoles and nuclei, but more or less rounded-up, there may be no demarcation, and the endoplasm may fill the body to the pellicle. The occurrence of amoebas, some with, and some without ectoplasm, in adjacent areas in the same preparation suggests the action of some internal factor of metabolism or possibly of senescence or depression in certain amoebas. Individuals without differentiated ectoplasm occur also in *E. dysenteriae.*

The endoplasm of *E. gingivalis,* even when free from food contents, is very noticeably vacuolated, as compared with the endoplasm of the motile *E. dysenteriae* from the colon of man and of the cat. This is not a mere protoplasmic alveolation but the formation of spherical, fluid-filled vacuoles which crowd the endoplasm often to its margin. They appear to grade into the food vacuoles both in size and in contents and may thus represent the last stages of the intracytoplasmic digestion of the contents of the food vacuoles. Inspection shows that the solid contents, both bacterial and non-bacterial, of the smaller vacuoles are less dense and less deeply stained than those of the larger ones, and leads to the inference that the fluid-filled vacuoles which grade down in size represent the later phases of the incorporation of ingested food.

In stained preparations instances are frequently seen of amoebas from which the liquefied chromatin of an ingested leucocyte is ejected in a viscous thread through a circular pore-like area in the cytoplasm, thus emptying the vacuole of these food remnants (pl. 17, Figs. 44,45, 49, 50). The normality of this phenomenon is still to be determined.

Organelles of the Endoplasm

The *food vacuoles* are the most evident and striking feature of *E. gingivalis,* mainly because of the size of the vacuoles, their siderophile contents, and their number. They thus constitute a considerable part of the volume of the body, computed, in one case, as 35 per cent. These vacuoles are spherical, or spheroidal, sometimes slightly deformed (pl. 14, Fig. 4) by mutual pressure or contact with the endoplasmic periphery or by contact with the nucleus, although they appear more often to compress it. They are filled by a clear non-staining fluid in which the food body floats in

EXPLANATION OF PLATES

Figures of *Endamoeba gingivalis* (Gros, 1849), Brumpt, 1913, from smears from human gingival exudate fixed in hot Schaudinn's fluid and stained with iron-haematoxylin, except where otherwise stated. ×2500 except on plate 17.

PLATE 14

All figures drawn from amoebas in fresh smears in physiological salt solution and iodine-eosin preparations.

Fig. 1. Amoeba that has just been killed in the margin of the iodine-eosin part of the smear. Note the ten pseudopodia thrust out in various directions. The nine earlier formed ones were stained pink with the eosin and are granular, while the last one thrust out was still colorless.

Fig. 2. Active amoeba in physiological salt solution with single pseudopodium thrust out in forward progressive movement. Nucleus cannot be differentiated among food vacuoles.

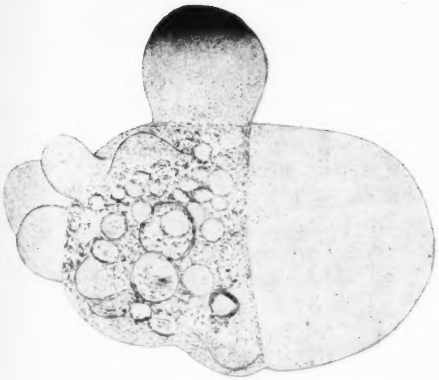
Fig. 3. Amoeba with single anterior pseudopodium stained with iodine-eosin.

Fig. 4. Active amoeba in physiological salt solution showing typical method of pseudopodial formation when not moving in a forward direction. Nucleus apparent near the center. Few food vacuoles.

Fig. 5. Active amoeba in same material with large pseudopodia at opposite poles.

Fig. 6. Amoeba in active forward progression showing a single hyaline anterior pseudopodium and the posterior tip with its accumulated mass of bacteria and débris on and about adhesive cone.

PLATE 14



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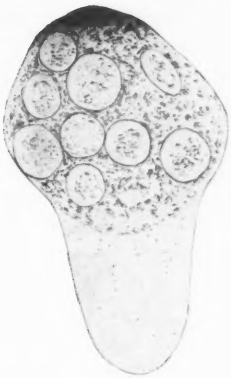

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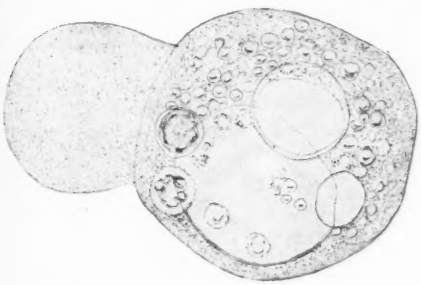

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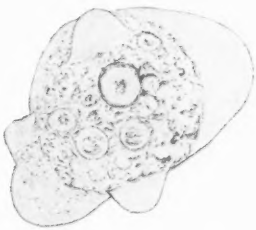

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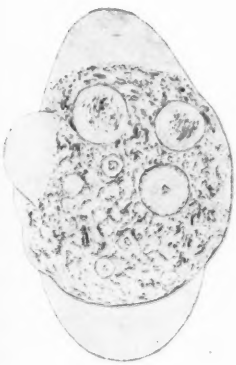

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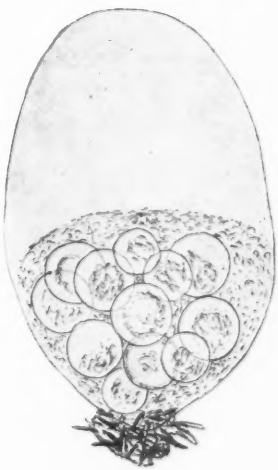

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a central position, or near the center of the mass in the deformed vacuoles. The volume of the fluid is very much greater than that of the enclosed food body, computed as from two to ten times as great in the vacuoles containing leucocytes, and as much as twenty-five times greater in some vacuoles containing bacteria.

The *food bodies* are characteristically of two kinds, leucocytes and bacteria. We have not seen epithelial cells nor erythrocytes in the vacuoles. It seems neither usual or customary for amoebas to ingest the erythrocytes. We infer that Goodrich and Moseley's (1916) statement of their presence in *E. gingivalis* may be based on the occurrence of rounded-up nuclei of leucocytes devoid of cytoplasm in the food vacuoles, whose size and appearance resemble that of plasmolyzed and digesting erythrocytes. The findings of Bass and Johns (1915) tend to support the occurrence of the erythrocytes in so far as they find certain vacuoles with a food body staining pink in carbol-fuchsin and methylene blue while the larger and less regular bodies stain blue. This difference is in our judgment due to a change in chemical state resulting from the progress of digestion rather than to an initial difference in the food body. The grounds on which our conclusion rests are: (1) structurally recognizable red cells are entirely absent in freshly examined living amoebas and in stained preparations; (2) the pink-staining bodies are in the smaller and older vacuoles; (3) the larger blue-staining bodies when not fully liquefied show traces of nuclear organization and the notch or cleft with the extranuclear centrosome (pl. 18, Fig. 49); and (4) the other and in some instances progressively smaller vacuoles are transition stages from normal leucocyte nuclei to homogeneous spherules of deeply staining fluid of nuclear origin.

However, Smith, Middleton, and Barrett (1914) state that they had noted

PLATE 15

Endamoeba gingivalis

Fig. 7. Amoeba ingesting large bacillus, similar to one lying in immediate neighborhood, with the inner end in a food vacuole and already showing action of digestive fluid. Very little chromatin on the nuclear membrane in plane of view. Numerous small rod-shaped bacteria occupy elongated food vacuoles in the cytoplasm. Traces of three small pseudopodia.

Fig. 8. Amoeba containing partly digested nuclei of leucocytes and various rod-shaped bacteria. Remnants of food contents in the smaller vacuoles. No ectoplasm.

Fig. 9. Amoeba with three large food vacuoles with leucocytic nuclei, two of which still show traces of adherent cytoplasm. Small vacuoles with remnants of food bodies but no bacteria.

Fig. 10. Binucleate amoeba constricting at the middle as though in the final stage of fission. Nuclei at opposite poles. One large vacuole with a polymorphic leucocytic nucleus. Numerous small vacuoles containing remnants of food bodies. Note irregular distribution of the peripheral chromatin in the nucleus at the right.

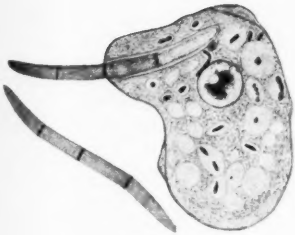
Fig. 11. Amoeba with leucocytic food bodies well digested except in one vacuole from which the viscous siderophile substance is being ejected through a canal through the cytoplasm and a ring of deeply stained substance in the pellicle.

Fig. 12. Amoeba with a peripheral film of ectoplasm, but no pseudopodia. Food vacuoles with bacteria and with leucocytic nuclei, the largest one of polymorphic type. Note the sparseness of peripheral chromatin adjacent to the vacuoles.

Fig. 13. Amoeba with retracted pseudopodia, peripheral ectoplasm, three leucocytic food vacuoles.

Fig. 14. Moribund abnormal amoeba, staining very lightly in the midst of a well-stained slide. Note the nearly empty food vacuoles, the nearly homogeneous cytoplasm, the ghost of the nucleus which scarcely stains at all, and the disorganized chromatin and karyosome. Spirochaete-like organism in one vacuole.

PLATE 15



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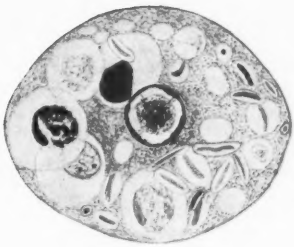

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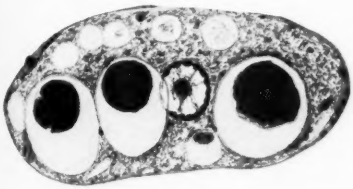

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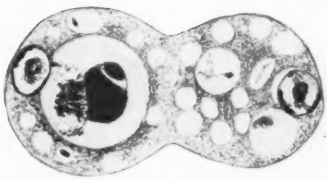

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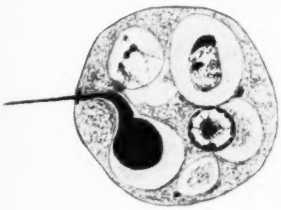

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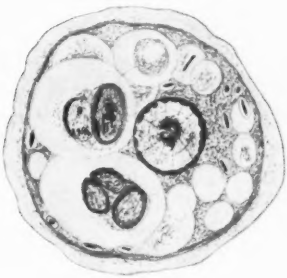

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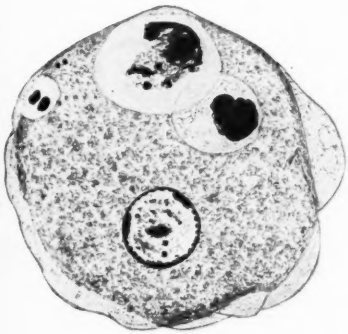

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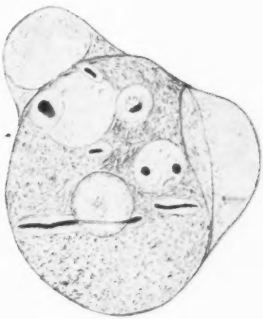

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the rapid hemolysis of a freshly englobed red blood cell which disappeared by solution without fragmentation in five minutes, and add that Smith and Barrett had seen the same phenomenon in endamoebas from pyorrheal pockets. Should this be normal and usual the disagreements as to the ingestion of erythrocytes would be more probably of observation rather than of fact. The extent to which *E. gingivalis* utilizes erythrocytes as food and the conditions under which it does so await further evidence. Such utilization appears to be slight or accidental rather than customary.

The nature and condition as well as the types of the leucocytes ingested by *E. gingivalis* are all obscured by the fact that the food bodies are obtained in an area of exudation where bacteria and cellular detritus abound. This problem can be attacked by an analysis of the amoebas *in situ* in the gums, but our available material at present is limited to smears only from the gums. In these the relationship of the amoebas to the tissues, and the distribution and types of leucocytes in the vacuoles and in the gingival area are disturbed by removal and smearing.

The preparations show as a rule only nuclei or their degeneration products in the food vacuoles, not normal leucocytes with cytoplasm. Only occasionally does one find evidence of a protoplasmic film around the nucleus. This may be because of the prompt digestion of the cytoplasm or of the ingestion of naked nuclei from the cellular detritus which abounds in the smears. The condition of the nuclei in the vacuoles and also in the detritus is such that identification of the type of leucocytes to which they belong is more or less conjectural. Many nuclei in the food vacuoles still show the bay or cleft which may even contain a granule in the cytoplasm which appears to be the centriole (pl. 18, Fig. 49). Such nuclei appear to belong to the transitional, mononuclear type. Some nuclei resemble those of the lymphocytes and once in a while one sees deeply lobed nuclei of the polymorphonuclear type (pl. 18, Fig. 44). Still less frequent are vague networks suggesting the nuclei of mast cells. The larger nuclei of epithelial and other human cells have not been found in the food vacuoles.

The food vacuoles enclosing bacteria usually contain but a single organism. Clustered groups occur, especially of the smaller bacteria, but they are rare. The vacuole conforms in contour to the shape of the ingested organism. *Micrococcus* lies in spherical vacuoles, *Bacillus* and *Bacterium* in elongated ones, and *Streptococcus* in ellipsoidal ones. Although elongated bacteria such as *Leptothrix* and *Spirochaeta* are abundant in our preparations they have only rarely been detected in

PLATE 16

Endamoeba gingivalis

Fig. 15. Cluster of amoebas on filamentous mass of *Leptothrix*. Note the large numbers of leucocytic food vacuoles. Compare Goodrich and Moseley's (1916, pl. 14, Fig. 14) indications of a similar association of these amoebas with *Leptothrix*, ×1200.

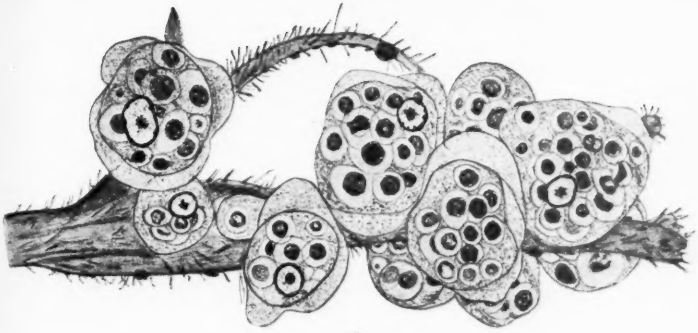
Fig. 16. A small amoeba with ectoplasmic pseudopodia at opposite poles, no food bodies but many vacuoles.

Fig. 17. An amoeba as in full swing of locomotion with a single broad pseudopodium, condensed endoplasm and traces of a posterior cone of attachment or holdfast.

Fig. 18. A large amoeba with three pseudopodia, the latest and largest forming anteriorly. Endoplasm crowded with food vacuoles containing leucocytic nuclei. Nucleus compressed, peripheral chromatin reduced to a thin layer.

Fig. 19. An amoeba with numerous small food vacuoles containing bacteria only. Peripheral chromatin in a nearly uniform layer, single karyosome in deeply stained halo. Two pseudopodia.

PLATE 16



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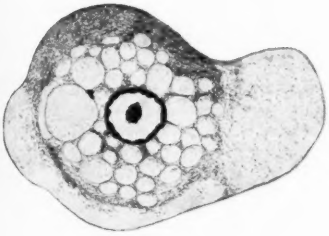

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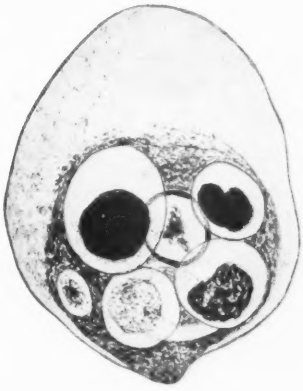

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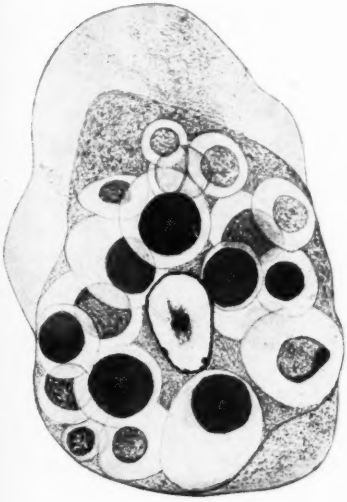

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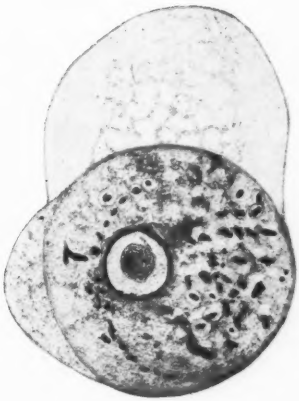

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the food vacuoles of the amoebas associated therewith (pl. 18, Fig. 51). The fine, deeply staining threads sometimes found coiled in the cytoplasm of the amoebas are in some instances demonstrably the filamentous remnants of the homogeneous, viscous substance of food bodies of leucocytic origin retained in the cytoplasm after ejection of the main mass. We infer that others of similar

PLATE 17

All figures magnified 5000 diameters. Nuclei, except that in Figure 42, drawn at equatorial focal plane in optical section. The karyosome is also drawn in optical section wherever located.

Endamoeba gingivalis

Figs. 20—31, inclusive. Note smaller size, greater deformation, granular halo, darker inner sphere, subdivided karyosomes, clear intermediate zone, and irregular peripheral chromatin.

Fig. 20. Nucleus not deformed. Note peripheral chromatin on nuclear membrane in interrupted, irregular clumps, very dark border to the granular halo and single, regular karyosome in small dark area. Lightly destained. Amoeba 11 by 14 microns.

Fig. 21. Note irregularity of peripheral chromatin, large angular granular halo, and single karyosome asymmetrical in central darker area. Amoeba 10 by 16 microns.

Fig. 22. Peripheral chromatin locally clumped, granular halo more decolorized, one large karyosomal granule eccentric in darker area. Amoeba 13 by 14 microns.

Fig. 23. Note deformation in contour, uniform layer of peripheral chromatin, very irregular, deeply stained halo, not decolorized sufficiently to reveal the karyosome. Amoeba 14 by 16 microns.

Fig. 24. Deformed, peripheral chromatin very irregular, heavily clumped, granular halo destained except in the distinct inner sphere immediately around the three subequal karyosomal granules. Granular material encroaching upon the intermediate zone. Outer border of halo more deeply stained. Amoeba 13 by 19 microns.

Fig. 25. Heavily decolorized, deformed, peripheral chromatin thin and clumped, granular halo with marginal rim and darker inner sphere about two karyosomal granules. Intermediate zone invaded by granules on one side. Amoeba 13 by 15 microns.

Fig. 26. Deformed, uniform, beaded peripheral chromatin, partial border to halo, central granular deeply stained mass around two spherical karyosomes. Possibly an early prophase of mitosis. Amoeba 13 by 14 microns.

Fig. 27. Deformed, sharply limited granular halo around three irregular karyosomal granules in darker inner sphere. Peripheral chromatin massed on one side. Amoeba 15 by 19 microns.

Fig. 28. Heavily decolorized, deformed, slightly irregular, beaded peripheral chromatin. Sharply defined granular halo around darker central sphere with three karyosomes. Amoeba 18 by 18 microns.

Fig. 29. Heavily decolorized. Peripheral chromatin massed on one side, granular halo sharply defined, with central inner sphere containing several crowded karyosomal granules. Amoeba 15 by 19 microns.

Fig. 30. Heavily decolorized. Peripheral chromatin uniformly spread or locally clumped, granular halo angular, sharply limited, with an irregular central inner sphere with three karyosomal granules in an asymmetrical position. Amoeba 10 by 14 microns.

Fig. 31. Heavily decolorized, deformed, peripheral chromatin very thin, locally clumped, granular halo very large, eccentric, central inner sphere delimited by a granular zone with a central group of four granules Possibly an early prophase of mitosis. See Dobell (1919, pl. 5, Figs. 93, 93) for somewhat similar halo. Amoeba 17 by 19 microns.

Endamoeba dysenteriae

Figs. 32—43 in motile phases. Note larger size, more uniformly distributed peripheral chromatin, granular intermediate zone, clear spherical halo, and single karyosome, centrally located in the halo but often eccentric in the nucleus.

Fig. 32. From bone marrow of head of femur in arthritis deformans. Fixed in formalin, decalcified, refixed in Schaudinn's fluid. Peripheral chromatin small in amount, clumped locally. Amoeba 8 by 12 microns.

PLATE 17

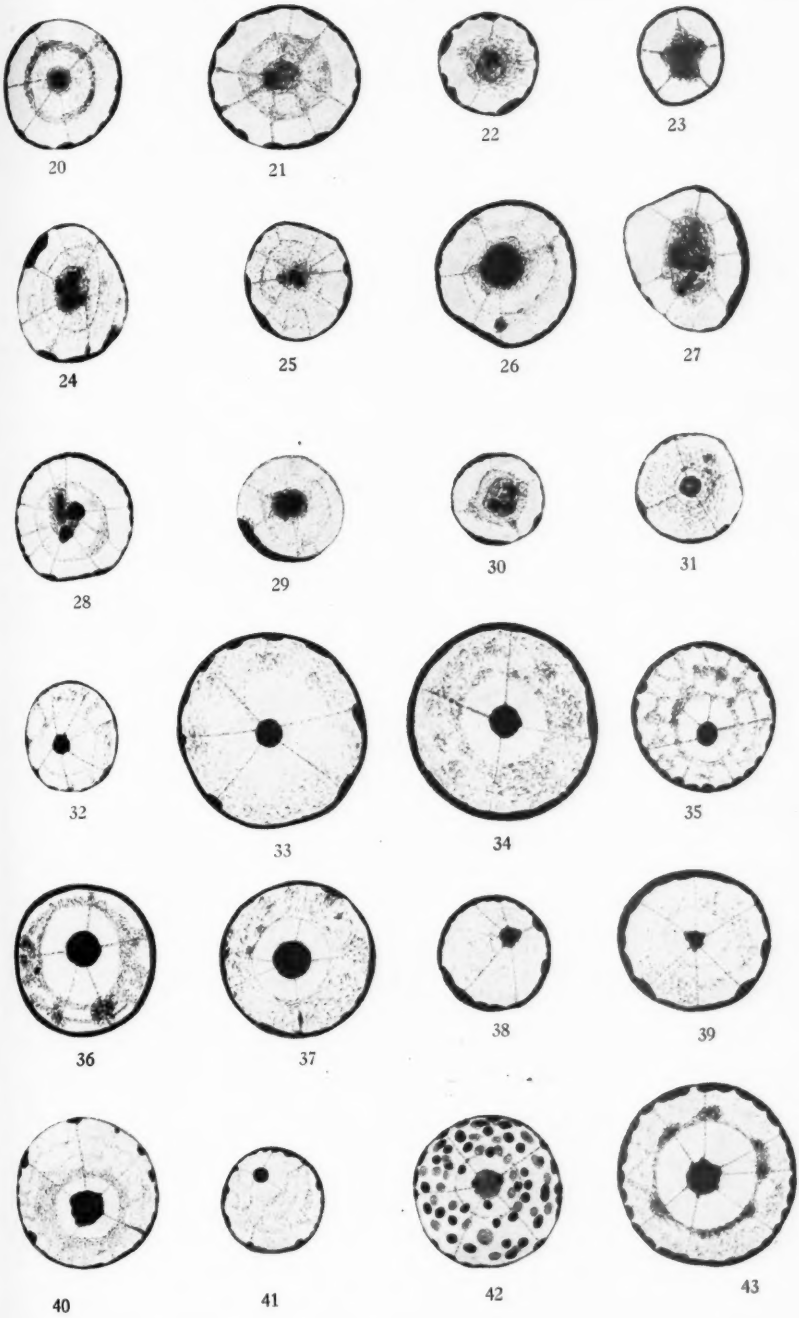


Fig. 33. From cold sputum from pulmonary amoebic abscess. Peripheral chromatin regularly distributed and locally clumped. Amoeba 19 by 27 microns.

Fig. 34. From amoebic ulcer of skin in fatal case of amoebic liver abscess, fixed three days after death. Chromatin uniformly layered on the membrane. Amoeba 18 by 27 microns.

Figs. 35 and 36. From autopsy material of amoebic ulcer of colon from amoebas in tissues. Peripheral chromatin uniformly distributed, beaded or layered. Amoebas 17 by 21 and 16 by 19 microns, respectively.

Fig. 37. From inguinal lymphatic gland in Hodgkin's disease removed by operation and fixed in formalin. Peripheral chromatin layered. Amoeba 17 by 18 microns.

Figs. 38 and 39. Autopsy material from liver abscess. Peripheral chromatin beaded and somewhat irregular. Amoebas 12 by 15 and 16 by 21 microns, respectively.

Fig. 40. From purulent surface of colon of cat infected from an acute case of human amoebiasis. Peripheral chromatin very irregularly clumped. Amoeba 23 by 28 microns.

Figs. 41 and 42. From amoebas in stool of chronic human amoebiasis. Peripheral chromatin rather uniformly distributed with local clumping in rather uniform blobs. Fig. 42. Nucleus viewed in contour. Amoebas 11 by 11 and 8 by 11 microns, respectively.

Fig. 43. From fecal smear from a case of acute amoebic dysentery. Chromatin uniformly clumped. Halo very large with aggregations of stainable granules at junctions of spoke radii. Amoeba 22 by 22 microns.

appearance, but not with an enveloping vacuole and having no present connection with any vacuole, are intracytoplasmic remnants of the viscous thread formed at ejection and entangled in the cytoplasm (pl. 18, Fig. 46).

There are amoebas feeding solely on leucocytes (pl. 16, Fig. 18) and others with bacteria only (pl. 18, Fig. 51) in their vacuoles, while a few contain both. The large numbers of bacteria figured by Mendel (1916) appear to be over or underlying rather than ingested organisms. Preparations made by the wet-smear method do not confirm the presence, normally, of such large numbers of bacteria. A survey of amoebas from three different cases repeatedly exam-

PLATE 18

Endamoeba gingivalis

×2500

Fig. 44. Two amoebas joined by fusion of ejected siderophile strands from leucocytic food vacuoles. Note siderophile rings in the pellicle at orifices of emergence. Food vacuoles with leucocytic contents only. No ectoplasm visible.

Fig. 45. A similar pair of amoebas whose juxtaposition suggests retraction of the viscous siderophile substance of the two vacuoles which had fused. No ectoplasm visible.

Fig. 46. An amoeba whose food vacuoles have no formed contents. A siderophile thread appears to have been extruded through the cytoplasm and to have ricocheted five times across the endoplasmic mass, rebounding at or near its periphery, with one end emerging through the ectoplasm. The vacuole from which it originates lies near the siderophile ring from which a protoplasmic process has been extruded. Ectoplasmic zone sharply delimited.

Fig. 47. Apparently moribund. Ectoplasm and endoplasm not clearly delimited. Chromatin deliquescent on membrane. Food vacuoles empty or abnormal.

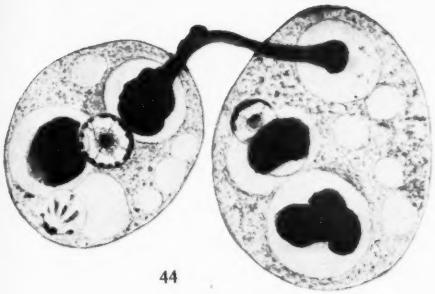
Fig. 48. Small amoeba with no ectoplasm visible. Coiled elongated bacterium in food vacuole.

Fig. 49. Large amoeba crowded with food vacuoles exclusively with leucocytic contents. Deeply stained granular halo on the nucleus. Siderophile spheres in food vacuoles with concentric peripheral laminations. One vacuole extruding a siderophile thread.

Fig. 50. Siderophile substance emerging from three lobes of a leucocytic food body in three strands and fusing peripherally.

Fig. 51. An amoeba with no ectoplasm visible, crowded with elongated food vacuoles each with an elongated rod-like bacillus.

PLATE 18



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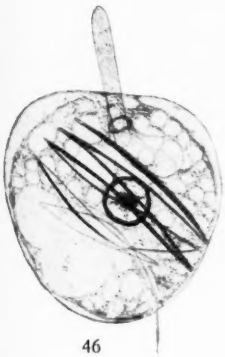

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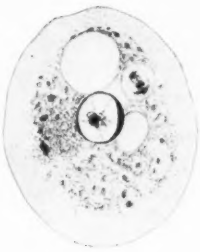

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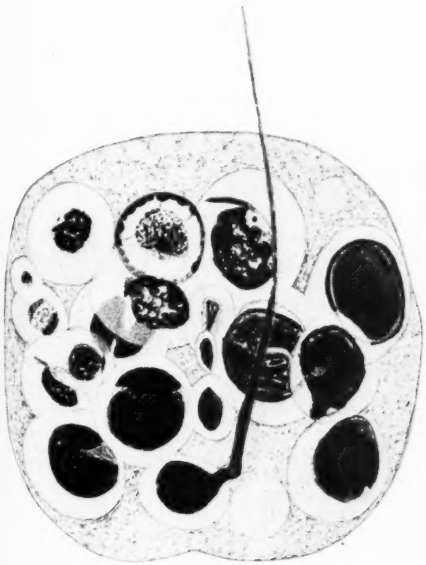

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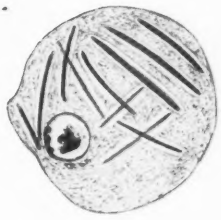

51

ined, together with numerous isolated preparations, is convincing that *Endamoeba gingivalis* is primarily a feeder upon nuclei and cells of its substrate and only secondarily upon the bacterial milieu with which it is associated. Although bacteria in considerable variety and very great abundance are continually present around them, the amoebas have in their food vacuoles nuclei rather than bacteria. When bacteria are present their number is generally so insignificant as to give the impression of contamination rather than selection.

The relative volumes of food of nuclear and of bacterial origin stand in still sharper contrast, the nuclear material appearing to be many thousandfold greater than the bacterial material. The duration of the intravacuolar status of the two kinds of food may favor a larger estimate of the total bacterial contribution; but the trend of the evidence is to the conclusion that the amoebas feed selectively on the leucocytes and the nuclei of leucocytes to the exclusion of those of other cells, and that bacteria are not the main food and may be largely contaminative rather than selected.

The extrusion of food bodies of nuclear origin is seen not infrequently in smears. This appears to occur only in nuclei which have been liquefied by the digestive process and reduced to a homogeneous, viscous, deeply staining siderophile fluid. Comparison of a number of such food bodies indicates a progressive disappearance of the chromatin network and the dissolution of the chromatin and nuclear sap into a substance of more or less homogeneous appearance. This sometimes shows a concentric stratification with a narrow outer, more deeply staining shell, a clear narrow zone within this, and a homogeneous central mass, less deeply stained (pl. 18, Fig. 49). These are so frequently observed in heavily destained smears that they are to be interpreted as results of metabolism and not artifacts of the staining process.

This homogeneous substance is ejected from certain vacuoles of some amoebas in our smears. It occurs from a *single vacuole only,* as a rule, and the material ejected comes mainly from the food body rather than from surrounding fluid. It is ejected along a canal through the endoplasm and ectoplasm, if present, and through the pellicle. At the point where it traverses this layer a deeply staining ring is formed surrounding the opening (pl. 18, Figs. 44, 45). There is no evidence that this canal and the ring are definite or permanent organs. They appear to be temporary, and in the case of the ring to be the result of the local condensation of the pellicle. The substance is shot out or dragged out in long tenuous strings, which may be several diameters of the amoeba in length. They resemble in stainability and physical appearance the strung-out degenerating nuclei of the gingival exudate often seen in smears. The substance is evidently remarkably viscous, and resistant to dissolution. Strands from adjacent amoebas coalesce in some instances (pl. 18, Figs. 44, 45). In one instance (pl. 18, Fig. 46) the thread seems to have ricocheted through the cytoplasm during the process. The same amoeba exhibits an *endoplasmic* protrusion through the ring in the pellicle, which persists after the disappearance of the food body.

It is probable that this phenomenon is a consequence of the smearing process. It affects, however, but a single food body, as a rule, and occurs also in amoebas that are embedded in bacterial masses. These masses show no immediate effects of disturbance, and the amoebas with the extrusion show no more distortion than others without it. It is possible that the phenomenon results from contractions of the amoeba rather than from external compression.

Nucleus

The *nucleus* of *E. gingivalis* is its most distinguishing characteristic and conclusively demonstrates its specific distinctness from *E. dysenteriae* and all other amoebas of man. The nucleus of *E. gingivalis,* in common with those of other species, is spherical in form but is subject in this species to a greater proportion of minor irregularities in contour than is usual in other species. In some instances these are clearly the result of pressure of adjacent food vacuoles. In other instances the existing contacts do not suggest such pressure. There is thus either a greater crowding of food vacuoles in *E. gingivalis,* or a greater pliability of the nucleus in this species than in others in which its sphericity is more uniformly maintained.

The *diameter of the nucleus* varies from 1.8 to 5.6 microns in seventy-five amoebas from various preparations from three different persons. There is little evidence of a difference in size in the three cases. In a case in which there is no history of pyorrhea, no devitalized teeth, and only a few fillings, the diameters of 25 nuclei range from 1.8 to 4.4 and average 2.93 microns in 25 amoebas whose mean diameters range from 9.1 to 17.7 and average 12.7 microns. The amoebas in this case are few in number and of small size with larger ones on some days.

In a second case, also with no history of pyorrhea, no devitalized but a number of filled teeth, the diameters of the nuclei range from 2.4 to 4.0 and average 3.34 microns in twenty-five amoebas whose mean diameters range from 12 to 20.9 and average 16.2 microns. Preparations made ten years prior to those from which these measurements were taken show a range in the diameters of the nuclei of 3.2 to 4.8 with an average of 3.7 microns in twenty-five amoebas with mean diameters of 10.8 to 20.0 and an average of 15.3 microns.

In a third case in which there is a history of pyorrhea for thirty years with recurrent formation of pyorrheal pockets, six devitalized teeth remaining and four extracted, and a number of fillings, the diameters in twenty-five nuclei range from 3.0 to 5.6 and average 4.01 microns in twenty-five amoebas whose mean diameters range from 11.3 to 21.6 and average 16.5 microns. The amoebas are abundant in this case.

There is thus an increase in size of about 30 per cent in the diameters both of the nucleus and of the whole amoeba in this case of long standing infection as compared with that of a light infection with more normal gums in the first case.

The nucleus (Fig. D) consists of a membrane (*n. m.*), peripheral chromatin (*p. chr.*), intermediate zone (*int. z.*), granular halo (*gr. h.*), a central darker area or inner granular sphere (*in. sp.*), karyosome (*k.*), spoke radii (*sp. rad.*), and nuclear fluid.

The *nuclear membrane* is a thin homogeneous sheet of uniform thickness, visible in some preparations (pl. 15, Fig. 13; pl. 17, Fig. 29) in optical section as separate from the peripheral chromatin applied to it, by its lighter stain. The chromatin of the nucleus of *E. gingivalis,* as in other amoebas of man, is gathered in two regions of the nucleus, namely, in the peripheral zone on the inner face of the nuclear membrane, and in the karyosome.

The *peripheral chromatin* (*per. chr.*) is best seen in optical section at the equator of the nucleus. In *E. gingivalis* it is generally found in a beaded state, or in larger aggregates, with the scattered masses of chromatin flattened against the membrane and *convex* inwardly. Only rarely (pl. 17, Fig. 23) does it approach the condition of a continuous, uniformly thick layer spread over the membrane throughout. Even in such cases sharp definition will sometimes reveal slight traces of clumping. The peripheral chromatin is markedly uneven and irregular in distribution.

The clumps are, as a rule, localized in one or two regions in the section, and dispersed and irregularly scattered in the other arcs as originally described by Chiavaro (1914). They also vary greatly in diameter, thickness, and volume. As a result of these irregularities, the nuclei often have an appearance, under low magnification, of incompleteness. In comparison with those of *E. dysenteriae* they are thus much less regular in structure and appear to be sparsely supplied with peripheral chromatin (pl. 17).

A comparison of a large number of nuclei in a number of different preparations gives the impression that in many instances the chromatin tends to mass on the areas least in juxtaposition to the food vacuoles, or that the areas nearest the vacuoles have least peripheral chromatin. This relation is not universal but predominates generally when tested, suggesting chromatin reduction in the region of contact with metabolic activity.

The *intermediate zone (int. z.)* is a wide clear region lying between the peripheral chromatin and the karyosome about 0.25 nuclear diameter in width and containing little or no substance stainable in either iron-haematoxylin or Giemsa. This area of unstained nuclear sap is traversed by a varying number of delicate filar or granular spoke radii (*sp. rad.*) which connect peripheral clumps of chromatin with the granular halo about the karyosome, especially with its projecting angles, and pass through this to the karyosomal granule or granules. Their position is normally radial but in some instances they are deflected from this course.

The central, more deeply staining mass in *E. gingivalis* is divisible into an outer granular halo (*gr. h.*), a karyosome, and an inner granular sphere (*in. sp.*) around a karyosome or cluster of karyosomal granules. This mass is central or subcentral in location. It is even more uniformly central than is the karyosome of *E. dysenteriae* ***in the motile state*** but the karyosome within it is much more variable in position than that of *E. dysenteriae* with respect to its halo. In the more stabilized conditions of the cyst after mitoses are completed, the karyosome of *E. dysenteriae* is normally central in nucleus and halo. In the motile phase it is much more variable in position, and frequently off center in all preparations accessible to us (pl. 17, Figs. 32-43).

The structure of the ***granular halo*** in *E. gingivalis* (pl. 17, Figs. 20-31) is variable, in part as the result of decolorization, and in part probably in consequence of metabolic conditions. It is a very large body whose diameter is approximately half that of the nucleus. Its contour is irregularly polygonal with projecting angles passing into spoke radii, or subspherical, or ellipsoidal. By destaining it is resolvable into an irregular granular structure in which there are traces of a mesh or alveolar sponge work. This peripheral mass is fairly uniform in consistency within itself except for its margin, which may be more deeply stainable (pl. 17, Fig. 28), and except for the inner sphere around the karyosome, which is more or less indistinctly differentiated but varied in appearance according to the amount of destaining. If destaining is prolonged the inner sphere fades into a vague cloud with a few darker peripheral points. The intermediate zone surrounding it is completely destained, except for the spoke radii, when the stain in the granular halo is sufficiently reduced to reveal the enclosed karyosome. If the halo is but slightly destained the karyosome is detected within it with difficulty. The meshwork is fairly uniform throughout. In no case do we find it in well-stained preparations extending to the periphery as figured by Leyden and Löwenthal (1905) and reproduced by Doflein (1916, Fig. 682C). In heavily

destained nuclei we find in optical section a circular peripheral boundary as in Doflein's Figure B. These figures and those of Hartmann (1910, Fig. 5, reproduced in many German texts) fail to make the distinction between the outer clear zone on the one hand and the granular or alveolar zone of the halo on the other. Chiavaro's (1914) figures faintly portray the halo and one to three granules. For a clear understanding of the differences between *E. gingivalis* and *E. dysenteriae* it is essential to determine sharply these outer limits of the granular halo and its relations to the karyosome. These differences can be clearly brought out by controlled decolorization.

The *karyosome* is a deeply staining homogeneous granule, or a group of two or three loosely agglomerated bodies of spherical or irregular shape. Their location is central, subcentral, or in some instances eccentric (pl. 17, Figs. 20-31). When a single body is present it is often spherical; but ellipsoidal, irregular, and asymmetrical forms also occur, especially in the clustered granules. In stainability these bodies resemble the karyosome of *E. dysenteriae*.

An inspection of published figures of the nuclei of *E. gingivalis* (Prowazek, 1904; Leyden and Löwenthal, 1905; Bass and Johns, 1915; Chiavaro, 1914; Hartmann, 1910; Brumpt, 1913; Smith and Barrett, 1915; Craig, 1916; Mendel, 1916; Goodrich and Moseley, 1916; Goodey and Wellings, 1916; Nowlin, 1917*o*; Dobell, 1919; Hartmann and Bêlar, 1921, and Nöller, 1922) convinces us that these figures are inadequate. A differential diagnosis from *E. dysenteriae* on nuclear structure is difficult if not impossible from these figures. All figures prior to those of Dobell give so little detail and are on so small a scale that the finer structure is not critically revealed, while the two figures of Dobell (1919, pl. 5, Figs. 93 and 94) are not typical of the material at our disposal and rather closely resemble those of his and of our figures of *E. dysenteriae*. He figures (his Fig. 94) a thick, heavy, homogeneous, uniform layer of peripheral chromatin, or one only very slightly indented (Fig. 93). The karyosome is figured by him as solid and spherical (Fig. 94) or ellipsoidal (Fig. 93); but such irregularities as appear in these outlines seem to be caused by the coarse mesh of the half-tone. He states that the karyosome is spherical, and characteristically expresses his belief that Prowazek's (1904) finding of several separate granules is incorrect, citing the fact that he, himself, had not so found conditions in normal individuals. In our material which has been promptly fixed and carefully decolorized, with cytoplasm, food vacuoles, and nuclear structure of the general and supposedly normal type, the somewhat irregular or subdivided karyosome is of very general occurrence. Dobell admits (p. 95) that he had studied only a limited amount of material.

His figures differ also in another feature from our findings (pl. 17, Figs. 20-31), namely, the presence of a very narrow, *clear* halo around the karyosome, with a faintly stained vaguely structureless intermediate zone. We find, as a rule, a granular, stainable halo with rather more definite peripheral margins. It is surrounded by a colorless or less granular or less stainable intermediate zone, and is, relatively, decidedly wider than the halo Dobell found. On the whole, his figures are rather strikingly similar to those of the nuclei of motile *E. dysenteriae* on his plate 5. This similarity has not been found by us to be usual or prevalent in any cases of infection or preparations of *E. gingivalis*, nor does it appear in the previously published figures of others. The nearest approach to his type is seen in our plate 17, Figure 31, the halo from a small amoeba.

Dobell's figures also lack spoke radii

which a skilfully used binocular brings to light in this species.

In this comparison we infer not that Dobell has figured *E. dysenteriae,* but rather that the nucleus as drawn by him is not, in a single structural feature, typical of the nucleus of *E. gingivalis* when critically resolved with the binocular in preparations made immediately by the wet-smear, Schaudinn, iron-haematoxylin method.

When viewed with low oculars, well-decolorized nuclei give a vague picture which resembles the vacuolated zone about the karyosome in the widely copied figures of Leyden and Löwenthal (1905). This appears to be based on the spoke radii and the denser sphere of granules on the periphery of the granular halo. Resolution under optimum optical conditions reveals the structures figured by us.

The *homologies* of the nuclear zone in *E. gingivalis* with those of *E. dysenteriae* are as follows: The peripheral chromatin, spoke radii, and karyosome or karyosomal bodies of the two species are respectively similar in location, and are similar, though not identical, in structure. The intermediate zone and the halo are also homologous in location and relations, but differ markedly in the motile phases of the two species (compare Figures 20 to 31, with Figures 32 to 43, pl. 17).

Nuclear Structure in Endamoeba Gingivalis and in E. Dysenteriae

The analysis which we have made of the nuclear structure of *E. gingivalis* reveals variability in dimensions, form, number, and arrangement of the karyosomal bodies, and in the picture of the karyosomal halo according to the degree of decolorization. It will be at once apparent to all familiar with the finer details of nuclear structure in *E. dysenteriae* that this amoeba differs strikingly from the amoeba of the gums in the structure of the karyosome and the region immediately enveloping it.

The intermediate zone of E. gingivalis is relatively free from stainable granules while that of E. dysenteriae is clouded with them. The karyosomal halo of E. gingivalis is composed of a deeply stainable cloud of granules with a darker central sphere around the several karyosomal granules. The halo of E. dysenteriae is free from structures other than spoke radii and the karyosome is single and spherical.

Another measurable difference is that the diameter of the halo of *E. gingivalis* is one-half, or more, of that of the nucleus, while in *E. dysenteriae* it is often only 40 per cent or less. Our figures (pl. 17, Figs. 32-43) give a larger proportion than is normal of nuclei with large halos in *E. dysenteriae.* These cytological differences are sufficient to make feasible a clear distinction between infections by these two species in the motile phases, which are the only ones thus far known to occur in tissues.

On the basis of these differences it is clearly evident that the nucleus of *E. gingivalis* is structurally distinct from that of *E. dysenteriae.* This is in addition to the distinctions resting upon their initial areas of infection in the buccopharyngeal and intestinal regions respectively, to the encystment of the latter, and to the seeming absence or at least rarity of the process in the former, and to the differential or predominant feeding of one upon leucocytes and of the other, in the motile phases in acute dysentery, upon erythrocytes.

In demonstration of the nuclear conditions in *E. dysenteriae* we have made a detailed structural analysis (pl. 17) of the nuclei of motile amoebas from the bone marrow in arthritis deformans (Fig. 32); from the sputum in amoebic abscess in the human lung (Fig. 33); from human skin ulcer (Fig. 34); from dysenteric ulcer in acute amoebic dysentery in man (Figs. 35-36); from the inguinal lymphatic gland in Hodgkin's disease (Fig. 37); from human amoebic liver abscess (Figs. 38-39);

from areas of active ulceration in the colon of the cat induced by amoebas from an active human case (Fig. 40); from the stool in chronic human intestinal amoebiasis (Figs. 41, 42); and from the stool in acute human intestinal amoebiasis (Fig. 43). As stated in the explanation of the plates this material is not the same in freshness at fixation, or in method of fixation. The staining in all cases was done by us and is by a uniform iron-haematoxylin method.

The constant features in all these nuclei of *E. dysenteriae* from these various sources are: the single karyosome, usually spherical but sometimes irregular, and not infrequently eccentric; the *clear* halo around it; the granular intermediate zone; and the rather evenly distributed peripheral chromatin.

In contrast with these nuclei, those of *E. gingivalis* have more frequently an *irregular* and often subdivided karyosome, a *granular* halo often of a relatively larger size, with denser periphery and inner sphere, a clear intermediate zone, and more clumping, and less regular distribution, of the peripheral chromatin. The outline of the nucleus is more liable to local deformation and it is smaller on the whole than in *E. dysenteriae*.

We have thus far been unable to find a sufficient number of stages of mitosis in *E. gingivalis* to determine the number of chromosomes. It is six in *E. dysenteriae* as will be shown in a paper soon to be published.

The data here presented indicate that *Endamoeba gingivalis*, known thus far only in the motile stage, has a nucleus of different structure from that of *E. dysenteriae* in the motile phase both as it occurs in the bowel and in various tissues. Specifically, the nuclei of amoebas in bone marrow in arthritis deformans are decisively of the type in *E. dysenteriae*. They do not resemble in any particular the nuclei of *E. gingivalis*. We have found no evidence that the amoebas usually associated with gingival abscesses occur in the bone marrow in arthritis deformans of Ely's second type.

On the other hand it is possible that *E. dysenteriae* might occur in abscesses in the buccal region. Attention is directed to the desirability that all cases of such abscesses should be investigated critically to determine the species of amoeba present in the tissues.

Summary

1. The food vacuoles of *Endamoeba gingivalis* contain leucocytes or their nuclei in stages of liquefaction and digestion. Erythrocytes were not found. Certain bacteria also occur but are quantitatively a minor element in the food. In smears the siderophile leucocytic content of the food vacuole is sometimes ejected in a viscous string through the ectoplasm and pellicle.

2. The ectoplasm has a differentially stainable pellicle.

3. The nucleus is proportionately smaller than in *E. dysenteriae*, is less regularly spherical, and more often deformed by pressure.

4. The peripheral chromatin is less regularly distributed than in *E. dysenteriae* and is often clumped in unequal masses irregularly distributed. Some of these masses are connected with the karyosome by spoke radii.

5. The karyosome is generally subcentral, sometimes central, irregular, or angular, often subdivided into two or three or even four granules, while that of *E. dysenteriae* is more generally, but not always spherical, larger, and except at the mitotic period, not subdivided. In the motile phase of the amoeba it is very often eccentric.

6. The karyosomal halo in *E. gingivalis* is granular, and stains more deeply than the surounding intermediate zone, from which it is separated by a peripheral layer of larger, more deeply staining granules, which resist decolorization longer than does the inner part

of the halo. Not infrequently it contains a denser sphere around the karyosome. Angular projections are often seen where the spoke radii enter it. In *E. gingivalis* the karyosomal halo is generally, but not always, relatively larger than in *E. dysenteriae*. The halo of *E. dysenteriae* is clear and spherical and the layer of demarcation from the intermediate zone is not structurally differentiated so clearly as a distinct darker layer.

7. The intermediate zone in *E. gingivalis* is clear or less stainable than the karyosomal halo, while the reverse is true in *E. dysenteriae*.

8. The structure of the nucleus of the motile phase affords a satisfactory and critical basis for separating *E. gingivalis* from *E. dysenteriae* in motile stages. Cysts are unknown as yet in *E. gingivalis*. Reports of their detection are unconvincing.

9. Motile amoebas in human bone marrow have the nuclei of *E. dysenteriae*, not of *E. gingivalis*. Their nuclei are of the same type as in *E. dysenteriae* from the colon of experimentally infected cats, amoebic ulcers from the colon of man, from human stools in dysentery and in chronic amoebiasis, in human liver abscess, in the sputum in human lung abscess, in amoebic ulcers, of human skin, and in the inguinal gland in Hodgkin's disease.

10. The possibility that *E. dysenteriae* rather than *E. gingivalis* was the amoeba present in the malar abscesses reported by Flexner (1892), Kartulis (1893), Verdun and Bruyant (1905), Dubar and Leroy (1907), Bruyant and Pélissier (1909), and Lynch (1916), and by Artault (1898) in lung abscesses should be held open. Dobell's unsupported conclusion that the amoebas of these abscesses were *E. gingivalis* or endothelial or other cells and not amoebas of any sort must await fuller evidence of the supposed, but not as yet proved, tissue-invasion capabilities of *E. gingivalis*, and a more critical knowledge of the nuclear structure of the amoebas found in such abscesses.

11. We find no evidence of *Endamoeba gingivalis* in bone marrow in arthritis deformans of Ely's second type. The nuclei of the amoebas in the bone marrow are distinctly of the type in *E. dysenteriae* in the motile phase elsewhere in the tissues, or in the bowel. The degree to which *E. gingivalis* invades tissues is still to be determined.

A CONSERVATIVE METHOD FOR THE TREATMENT OF PYORRHEA*

By F. V. SIMONTON, D.D.S., San Francisco, California

THERE are two general clinical methods employed at the present time in the treatment of pyorrhea. One method involves the elimination of pockets by excision of the overlying gum. The other method seeks to preserve all tissue possible and at the same time effect a restoration of health. An intermediate method comprises the laying back of gum flaps to expose the roots for more ready removal of accretions; and the subsequent suture of the incisions.[1]

Of these three methods, the second mentioned, which we will term a conservative method, will be described herewith. We have learned as a result of our earlier studies that it is possible, by scaling, to abort the destructive processes and to place the tissues in a constructive physiologic condition.[2]

If we can accomplish this result by scaling, it seems unnecessary to excise the gum for the purpose of eliminating the pathologic conditions. It may be argued, of course, that the elimination of pockets by excision of the overlying gum is a hygienic measure, preventing lodgment of food débris; but we believe that, by a conservative method, sufficiently close apposition of the tissues and an adequate tonicity can be produced to minimize this factor, provided, of course, that the patient cooperate.

Instruments

We have perfected and adopted a set of eight instruments, including the periodontometers.[3] These instruments, which are of a spoon type, are all based on the same plan. The larger pair of scalers are duplicates of the periodontometers with the graduations omitted, and the remaining pairs (Figs. 1 and 2) are precisely similar, only smaller. They are numbered one to eight, respectively. With these few instruments, we find it possible to reach any portions of any of the roots of the teeth within the limits of rational treatment. This type of instrument was selected after careful consideration of the other forms in use, and we believe that it is superior to the straight edge type. In the design of some of the pyorrhea instruments, the fact that a considerable proportion of the area of the root surfaces is concave does not seem to have been recognized, and, in consequence, the blades of such instruments are even less adapted to scale concave

*From the California Stomatological Research Group (Dental Section).

*Aided by grants from the Carnegie Corporation of New York, the American Dental Association and the Associated Radiograph Laboratories of San Francisco.

1. Simonton, G. W.: Treatment of Pyorrhea by Surgical Exposure of the Tissues Involved; J.A.D.A. to be published.

2. Hanford, W. H., et al: A Contribution to Our Knowledge of Pyorrhea from the Standpoint of Histopathology, Dental Cosmos. 65: 12-17 (Jan.) 1923.

3. Simonton, F. V.: Examination of the Mouth, with Special Reference to Pyorrhea; to be published.

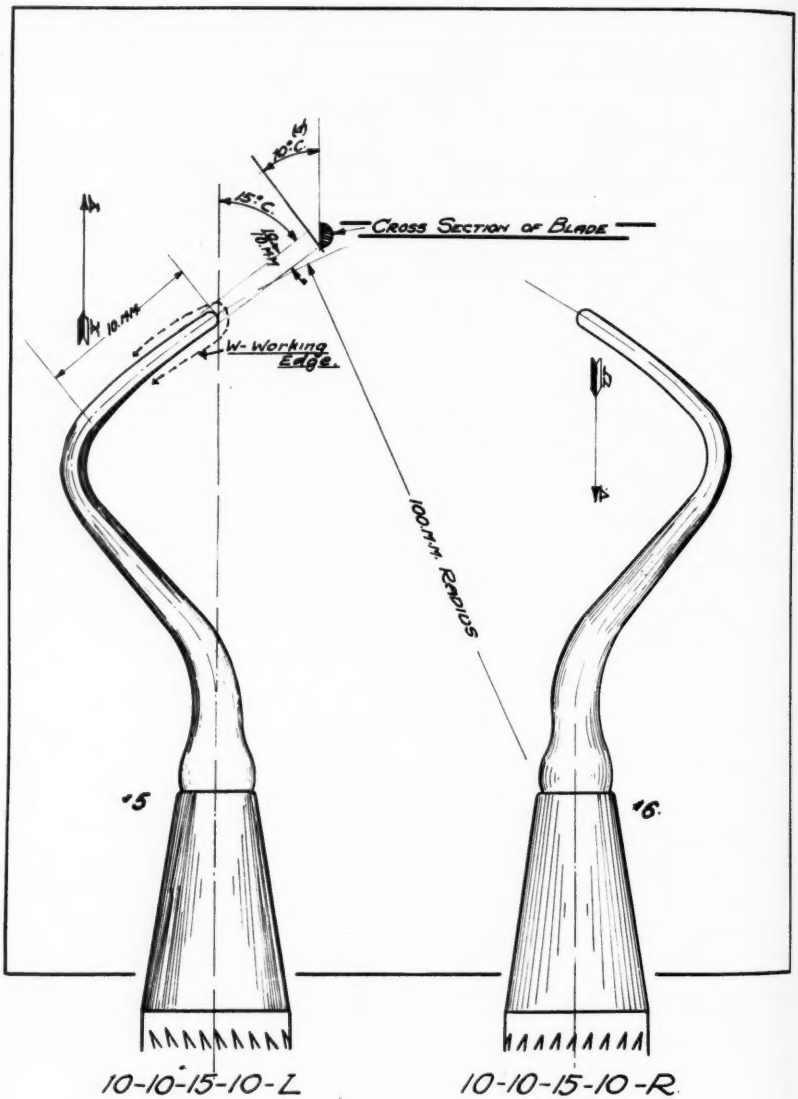

Fig. 1.—Pyorrhea scalers.

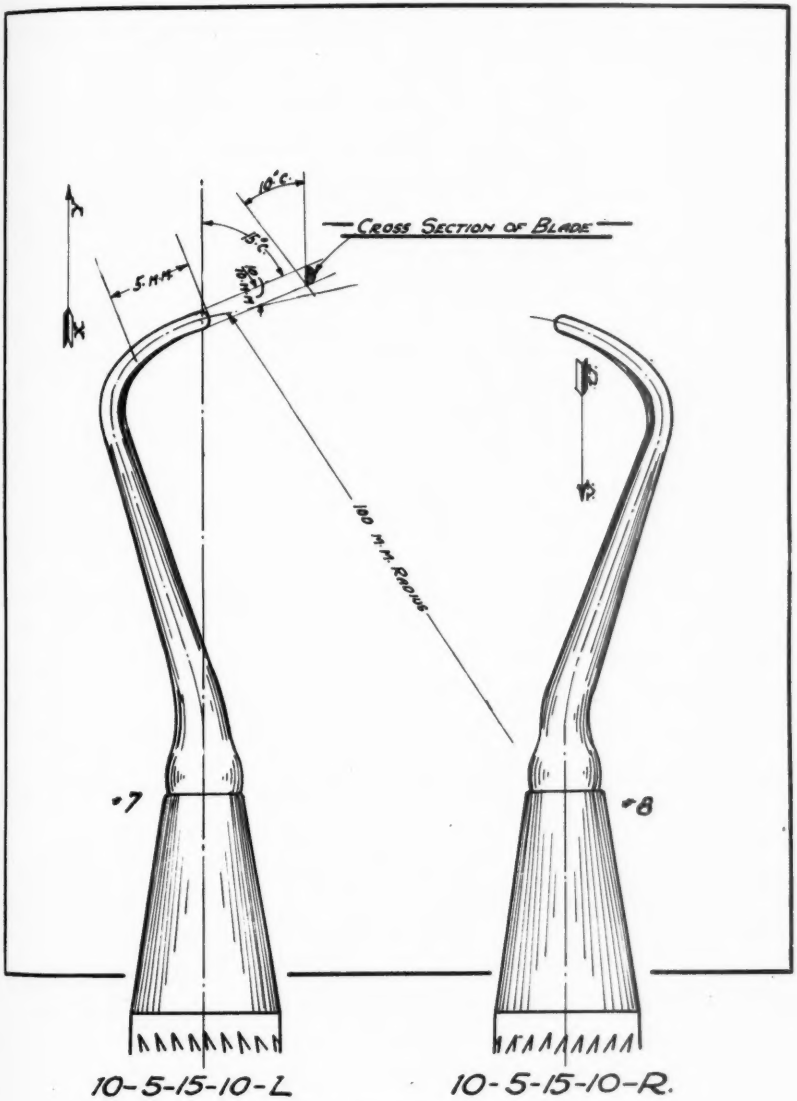

Fig. 2.—Pyorrhea scalers.

surfaces than they are to scale convex ones.

Figure 3 illustrates the result of attempting to scale a concave surface with a straight edge scaler. It is obvious that this instrument scrapes at points *A* and *B*, and fails to reach the root between these points. The objection to this instrument in scaling convex surfaces lies in the fact that it tends to cut flat surfaces, as shown in Figure 3. On the other hand, scalers of the spoon type may be adapted to contours exactly as a French curve is adapted to a curve by a draughtsman (Fig. 4). The working edge extends a considerable distance, as shown in Figure 1 at *W*, and, by proper inclination or rotation of the instrument, this edge can be fitted to the portion of the root being scaled.

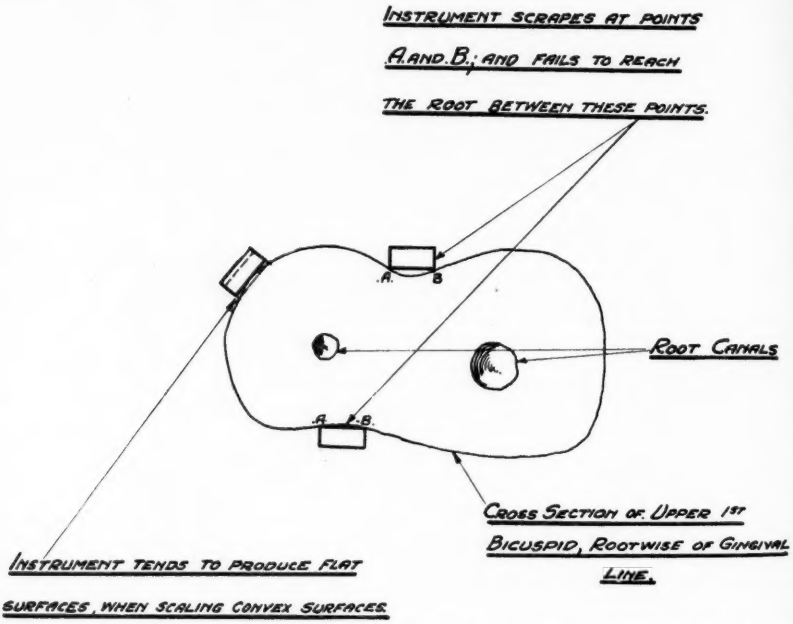

Fig. 3.—Diagram illustrating the lack of adaptability of a straight blade to contours of a root.

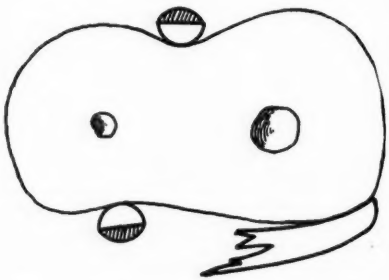

Fig. 4.—Diagram illustrating adaptability of blades of spoon type to contours of root.

A further objection to the straight edge scaler lies in the fact that it will not reach entirely to the bottom of a pocket, as shown in Figure 5. The application of a spoon type scaler is shown in Figure 6.

It cannot be denied that it requires

great skill and care to use these spoon type instruments correctly, and it is probable that most novices would prefer the other type; but it has been our experience that persistent use of the former leads to increased appreciation of their possibilities and overcomes the difficulties. The statement that a technic is difficult is not a sound argument in dentistry, provided that technic can be shown to be superior.

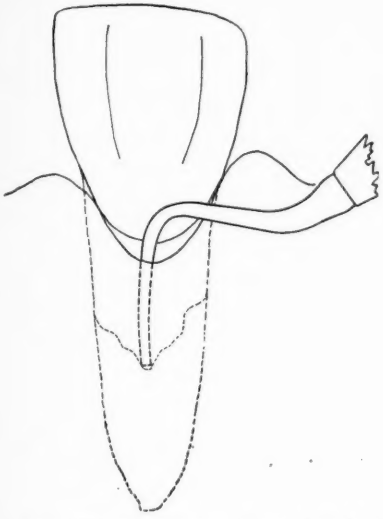

Fig. 5.—Diagram showing failure of straight edge scaler to reach bottom of pocket.

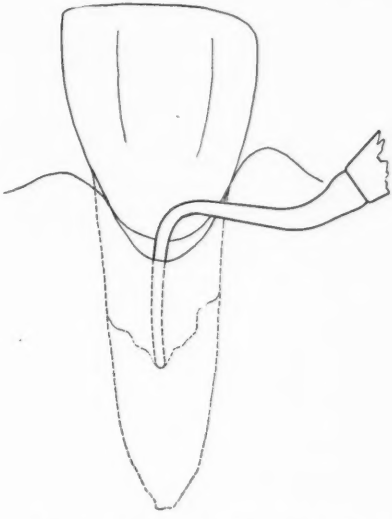

Fig. 6.—Diagram showing possibility of reaching bottom of pocket with spoon type of scaler.

Scaling Technic

The pocket is carefully explored in order that its outline may be vizualized in the mind of the operator. The larger, readily accessible deposits of calculus are then removed. The case is now ready for the finer and more careful scaling. The ideal method for this purpose consists in, first, so alining the instrument that the blade of the scaler fits the curve of the root, and altering the angle of application as the instrument moves, in such manner as continually to adapt it to the changing curvature of the root. Each area passed over is to be scaled in two opposite directions and, when possible, in four directions. The first two directions are longitudinal and transverse and the other two should be oblique to these. It is essential that the operator begin at some definite point, stepping his instrument continuously and progressively, and not scaling here and there, haphazard.

In this part of the operation, the portion of the root immediately adjacent to the line of detachment is left untouched for a distance crownwise, approximately 1 mm. To scale this zone, we begin at a given point, pass the scaler along the side of the root until the bottom of the pocket is reached and then, engaging the blade to remove débris or deposits, draw it crownwise. This is repeated until, moving along the line of detachment step by step, about 5 mm. of its length has been so treated. This 5 mm. length is then

rescaled by a push or pull stroke parallel to it. It will be noted that the operator is enabled to judge the direction of this parallel stroke as a result of his previously seeking out the line of detachment (or line of attachment) in his longitudinal strokes.

The surface of the instrument toward the tooth is flat from side to side, and slightly concave along the blade. The back of the blade, which comes in contact with the overlying soft tissues, is convex from side to side and slightly convex longitudinally. There is a uniform lessening in thickness as the tip of the blade is approached. There are no corners or thick edges to come in contact with the soft tissue. These instruments can be slipped between the hard and soft tissues completely to the attachment of the periodontal membrane, without lacerating, stretching or bruising the soft tissues. They are so thin that it is possible to scale approximating surfaces of teeth even though they are very close together, and to scale around contacts. The rounded backs prevent lacerations and, incidentally to the scaling of the roots, serve to massage and stimulate the soft tissues effectively. We believe in repeated scaling, to aid in the removal of any particles of deposit that have escaped attention; to free the wound from any fragments of dead tissue; to further surface the root, and finally to stimulate and massage the overlying soft tissues, relieve stasis and promote constructive physiologic activity.

We believe that the beneficial effects of repeated careful instrumentation have not hitherto been sufficiently emphasized, especially as regards the stimulus resulting from the massaging effect of this instrumentation.

We have undertaken to study technic by scaling a number of hopelessly involved teeth and subsequently extracting them. Some of the results will be presented later.

There is no question that the satisfactory treatment of pyorrhea is difficult and tedious, requiring long experience and a high degree of skill, but we are convinced that the results justify the effort. If the disease is not too far advanced, teeth can be saved and the investing tissues can be maintained in a reasonably healthy state for an indefinite period of time. Infection can be reduced and kept at a minimum. And all this can be accomplished without any intentional sacrifice of tissue.

DENTAL CORPS, U. S. NAVY*

THE annual report of the Surgeon-General of the Navy, which has been published recently, includes a number of interesting comments relative to the Navy Dental Corps.

In his discussion of the personnel of the medical department, Admiral Stitt includes the following remarks:

"One of the urgent needs of the medical department is an increase in the personnel of the Dental Corps. The apportionment of one dental officer to every 1,000 officers and men of the Navy and Marine Corps, which was arbitrarily determined several years ago, when the Dental Corps was first established, has been found to be totally inadequate to furnish satisfactory and complete dental service to the personnel. At the time this apportionment was proposed, the real value of dentistry in the naval establishment was not yet known nor was the importance of dentistry in its relation to general health fully understood. One of the important advances made in medicine during recent years has been the development and recognition of the dental surgeon's part in the cure, control and prevention of disease.

"The constant demand for emergency treatment by a great number of officers and men precludes the possibility of furnishing dental service which would comprise all that can be obtained from dental surgeons in civil life. The Surgeon-General earnestly desires the extension of such service to the personnel of the Navy.

"With the present numerical strength of the Dental Corps, it has been found impossible to assign an adequate number of dental surgeons to the various naval hospitals for the purpose of properly carrying on the important development of group practice. This cooperative system of treatment, which has the excellent effect of correlating the medical, dental and surgical specialists for purposes of diagnosis and treatment, has been recognized as a necessity and is practiced in the leading civil hospitals of this country.

"Another result of the present limited number of dental officers has been the inability of the Bureau of Medicine and Surgery to take full advantage of the appropriations allowed the Medical Department for postgraduate work when considering the assignment of dental officers to special educational courses. Opportunities for special dental instruction have been greatly restricted by the necessity of diverting the smallest possible number of dental officers from actual routine duties.

"This serious personnel situation which confronts the bureau is constantly emphasized by the receipt of insistent requests for the assignment of dental officers who cannot be supplied. Additional dental officers are needed in the destroyer, mine and special-service squadrons, in the train and light cruiser divisions, at the several Marine Corps bases, naval air stations, and at various navy yards, training stations, and hospitals.

"The clearly demonstrated inadequacy of the Dental Corps to cope with the situation, together with the general recognition of the importance of dentistry in maintaining general health, would seem to indicate that some action

*Extracts from Report of the Surgeon-General, U. S. Navy, for the fiscal year 1924.

should be taken in the near future to increase the strength of the Dental Corps to a number which will insure health and comfort and assist in preserving the physical fitness of the personnel.

"There are no reliable data or statistics of assistance in estimating the number of dental officers needed to provide adequate dental service, but it is generally considered by officers who have made a study of the subject that one dental officer to every 500 officers and men would be none too many. The bureau is of the opinion that an apportionment of less than two dental officers to every 1,000 officers and men would prove to be insufficient, and recommends that steps be taken to obtain a new apportionment of one to 500. It is realized that legislative action requires considerable time and that immediate relief cannot be obtained from this source. It is therefore strongly recommended that authority be granted to fill the Dental Corps to its authorized strength of 189. This would make the services of a dental officer available for every 615 officers and men and would relieve to a considerable extent the serious situation now existing.

"The conditions under which the apportionment of one to 1,000 was fixed have changed radically. Today, it is generally recognized that dental service is an important factor in the conservation of bodily health and that the physical and mental well-being of an individual are in a decidedly large degree dependent upon a healthy condition of the mouth."

In his report of the achievements of the Bureau of Medicine and Surgery during the four years preceding the date of the report, the Surgeon-General furnishes the following interesting information:

"January 1, 1921, may well be taken as the date from which to calculate the increases in efficiency that have been made in the Dental Corps of the Navy. During the several years from the establishment of the Dental Corps in 1912 until our entry in the World War, dental service in the Navy was in what might be termed a trial or experimental stage. The war was epoch-making for dentistry; its advent brought about an enormous expansion in the field of that branch of the healing art, and consequently a general recognition of the value and importance of dentistry in the Naval Establishment, together with an expansion in the size of the Dental Corps. However, such conditions did not make for permanent efficiency. The greatest item of improvement in administrative efficiency has been the establishment of the Dental Division in the Bureau of Medicine and Surgery. This division, as organized, places all dental activities which are necessarily intercorrelated under a single head. As now arranged, the Dental Division with an officer of the Dental Corps in charge, has supervision over all matters concerning the Dental Corps, the details of its administration, including the assignment and transfer of dental officers, the care of dental property, the supervision of reports and returns, the inspection of dental activities, and so forth, all of which had hitherto been handled in various divisions of the bureau in conjunction with the routine administration of other medical department activities.

"The establishment of the Dental Division of the Bureau of Medicine and Surgery is a source of considerable satisfaction to both medical and dental officers, as the former are relieved of some of their responsibility in purely dental affairs, and the latter are greatly encouraged by having a member of the Dental Corps detailed to care for their technical needs.

"The Navy Dental School opened February 3, 1923, as the dental department of the United States Naval Medical School. Its purpose is to furnish

postgraduate instruction in dental medicine to officers of the Dental Corps of the Navy and to train and equip men of the Hospital Corps as assistants to dental officers. Instruction is given in two courses of four months each, commencing in February and September.

"The establishment of the school is the result of a recognition of the value of dentistry in the Navy as a factor in the preservation of the health of the personnel and an appreciation of the importance of furnishing the very best dental service that the profession affords.

"The school is located on the grounds of the United States Naval Hospital, at Washington, D. C., in a building devoted to other uses during the War, which has been remodeled and equipped to meet the requirements of the instruction given.

"The situation of the dental school, in close proximity to the main building of the United States Naval Medical School, is such that its students have the benefit of instruction in basic medical subjects at the medical school proper. These subjects are taught by the officers of the medical school faculty in connection with the instruction given to medical officers of the regular class. The facilities of the medical school proper are at the disposal of student dental officers, and the joint instruction in bacteriology, medical diagnosis, and similar subjects, is invaluable.

"The dental school has a threefold function. In addition to the instruction offered, the institution provides a working laboratory for the construction of special prosthetic appliances which are being gradually introduced as a part of the dental service furnished by the Navy. The third function of the school is to supply dental service to the United States Naval Hospital, Washington.

"An important department of the school is the prophylactic clinic, where enlisted men of the Hospital Corps are trained as dental hygienists. Upon the completion of a thorough course of instruction, these men are assigned to duty with and work under the supervision of dental officers.

"An important innovation in the dental service became effective with the establishment of the Navy Dental School, through the adoption of a plan for extending to the officers and men of the Navy the benefits of certain prosthetic procedures.

"In the interests of efficiency and economy, an endeavor has been made to consolidate all dental activities of the larger stations into one central clinic, with an experienced dental officer in charge, and in all cases this has resulted in a considerable saving of supplies and equipment, and a more efficient dental service.

"A larger proportion of dental officers has been maintained at naval training stations than at other places, as it is considered especially desirable to make recruits as near dentally fit as possible during their early period of training.

"A system of inspection of the dental activities of the Navy by dental officers was put into effect during the fiscal year, 1923, and the results obtained are most encouraging. The reports of these inspections are a means of furnishing the bureau with information on the character of treatment given, the condition of dental property, and other data which has heretofore been difficult to obtain. It has been found that these inspections do a considerable amount of good and that a number of satisfactory conditions can be traced directly to them. It is believed that they have a decidedly good effect on both efficiency and morale.

"A revision of the dental supply table was completed during the fiscal year 1922. Changes were made by adding many new items essential to the needs of recent developments in dentistry, and items no longer considered necessary were eliminated. Subsequent additions have been made and the allowance tables changed to meet the progressive

needs of dentistry. Small amounts of non-standard equipment have been bought and sent to selected stations for trial.

"In addition to the major activities that have been outlined above, the dental officer in the bureau, under the direction of the Surgeon-General, has been actively engaged with various unclassified projects pertaining to the Dental Corps. Important among these items during the past three years is the following: Preparation and publication of a complete dental number of the United States Naval Medical Bulletin, which contained a number of original articles on professional subjects by officers of the Dental Corps.

"As has been pointed out, the Dental Corps has made remarkable progress within the past three years, but it is not desired to convey the impression that the dental service of the Navy has been developed to the point that is desired or considered necessary to provide all that is needed in the way of dental care and treatment for the personnel. The bureau has been greatly handicapped in carrying out its recently adopted policies in regard to dental treatment, by the shortage of dental officers. It is realized, however, that the matter of the size of the Dental Corps is something over which the Bureau of Medicine and Surgery has little control, while it is vitally interested and directly responsible for the character of dental service rendered. It is the Surgeon General's earnest desire that the dental service of the Navy be made to keep pace with, if not lead, professional activities in civil life."

DENTAL CORPS, U. S. ARMY*

DURING the fiscal year ending June 30, 1924, the Dental Corps has functioned under the restrictions imposed by the loss of approximately one-third of its commissioned personnel by the Act of June 30, 1922. By this Act, the Dental Corps was reduced in numbers from 237 to 158. The latter number of dental officers were maintained on duty during the greater part of the year.

For the period of this report, there were 129,219 persons treated; 236,333 sittings given; 86,469 permanent fillings, 17,041 temporary fillings and 6,119 root-canal fillings inserted; 1,168 crowns, 426 bridges and 1,936 dentures constructed; 40,834 extractions made; 25,354 patients given prophylactic treatment (removal of calculus and polishing of teeth); and 268 crowns, 589 bridges and 758 dentures repaired.

Authorization was obtained from the War Department for calling five Dental Reserve Officers to active service for duty at certain Army hospitals engaged in the treatment of beneficiaries of the U. S. Veterans Bureau. Careful selection of such personnel was made, and the dental clinics of the following hospitals were thus augmented by Reserve personnel as follows: Walter Reed General Hospital, Washington, D. C., one lieutenant; Fitzsimons General Hospital, Denver, Colo., one captain and one lieutenant; Letterman General Hospital, San Francisco, California, one captain, and Station Hospital, Fort Sam Houston, Texas, one lieutenant.

It has been found necessary to continue the objectionable itinerary service for the past year in order that commands at the smaller stations might receive some dental service. Many dental

*Abstracted from Report of the Surgeon-General, U. S. Army, to the Secretary of War for the fiscal year 1924.

officers were thus serving from two to four stations through periodical visits. Over 30 per cent of the dental officers on duty within the territorial limits of the United States have been serving on this kind of duty during the year.

On the accepted theory that a dental officer is responsible for the dental health of the command under the supervision of the surgeon, dental surveys have been made and recorded to determine the dental condition of each member of the command and to permit a systematic method for handling it. Likewise, as far as possible, group instructions in oral hygiene have been given the enlisted men of the various commands that individual cooperation in maintaining clean teeth and a satisfactory mouth prophylaxis would assist in preventing dental disabilities. The benefit to the military personnel in furthering a full program of oral hygiene cannot be overestimated. Such plan would greatly diminish the emergency cases of the future, but with our deficient personnel, it is folly even to hope that real preventive dentistry can be practiced by the dental officer whose time is entirely occupied with acute cases that are well beyond the preventive stage, such as pulpitis, acute infections, necessary extractions, etc. The utilization of dental hygienists would be of great value in augmenting the services of dental officers in fostering preventive dentistry, but limited appropriations allow of their employment at but five stations.

During the annual citizens' military training camps, 30,000 trainees were given a thorough dental examination, which included a complete survey of the teeth and adjacent tissues, with detailed notations covering extent and location of caries, extent and location of filling restoration in each tooth, missing teeth, teeth requiring extractions, the type and location of restoration supplying lost teeth, unerupted teeth, devitalized teeth, crowned teeth, extent of calcareous deposits, infectious processes and the condition of occlusion. Trainees were made acquainted with their dental and oral defects; received such emergency treatment as was required; were advised to seek immediate correction on their return home, and had explained to them the importance of proper care of the teeth as a prophylactic measure, and, as far as facilities permitted, their parents were notified of the dental conditions found and advised to exercise their authority in securing the corrections recommended. It is believed that the general information pertaining to the maintenance of sound teeth and oral health thus diffused throughout each group of young men of military age from practically every state in the Union will have a beneficent effect in establishing a desire on their part to secure and maintain dental fitness as an adjunct to physical efficiency for the military service. A dental chart with instructions, which has been added to the form used in conducting annual physical examinations of commissioned officers, requires a complete dental examination and record of conditions found. The general condition of the mouth, all carious teeth, fillings and dental restorations, are to be noted on this chart, thus furnishing a complete picture record of both dental and oral conditions found. This plan has proved efficacious in presenting facts regarding his teeth and mouth to each officer and permitting him to make necessary plans for their correction. Practically all dental clinics overflowed with commissioned personnel for a period of several weeks subsequent to the annual physical examination.

A four month's basic course of instruction for commissioned personnel of the Medical Department was held at the Medical Field Service School, Carlisle Barracks, Pennsylvania, from Sept. 1, to Dec. 21, 1923. Nine captains of the Dental Corps, Regular Army, attended this course, all of whom graduated. The value of this basic instruction to the dental officer cannot be overestimated.

It affords him a comprehensive knowledge of the Army, the mission of the Medical Department, and the integral function of the Dental Corps, and tends to divorce him from the narrow sphere of professional activity to which he is inclined to gravitate in the daily routine of office practice.

The Army Dental School, Army Medical Center, Washington, D. C., opened its third session, Jan. 3, 1924. Ten officers of the Dental Corps, Regular Army, and one officer of the Dental Corps, Oregon National Guard, were in attendance. The class graduated at the Army Medical Center, Washington, D. C., June 6, with appropriate joint exercises with the Army Medical School, Army Veterinary School and the Army School of Nursing. Two members of the class graduated as proficient with honor, one of whom received the Army Dental Corps medal. One class of enlisted men of the Medical Department was given the course of instruction in dental prosthesis.

Two dental officers have continued on special duty at the Army Medical School, Army Medical Center, Washington, D. C., furthering scientific dental research and study in bacteriology and pathology as related to mouth, jaws and teeth. The eight dental Reserve Officers Training Corps units noted in the last report have continued in operation during the past year. Six dental officers of the active list, one on the retired list and one medical officer have been retained on this duty as professors of military science and tactics at eight dental schools.

Increasing interest has been shown in the correspondence courses conducted for dental officers under direction of the several corps area headquarters. This practical course is proving of great value to Reserve dental officers in acquainting them with the progressive changes made in military administration and with advanced methods of professional procedure pertaining to the service. Efforts are being made to interest a greater number of reservists in this course.

It is readily apparent that an adequate and satisfactory dental service cannot be extended to the personnel of the Army nor even to all the smaller commands under the present quota of dental officers, based upon the proportion of 1 to 1,000 total strength of the Army. These figures were determined on nearly a quarter of a century ago when the true relation of dentistry to general health was little known and its importance in the military service as an adjunct to Medical Corps activities in the conservation of health and physical efficiency had not been proved. The need for an increased number of dental officers at a proportionate rate of at least twice the present quota is urgently necessary. This number would create an adequate professional service for the military personnel of all commands and permit of full and satisfactory service to all types of Army personnel dependent on the resources of a military station.

ANNUAL REPORT OF THE DENTAL EDUCATIONAL COUNCIL OF AMERICA

By ALBERT L. MIDGLEY, D.M.D., Sc.D., Providence, Rhode Island

THE relationships and responsibilities of the Council in furthering desirable standards in dental education have increased rapidly within the last two years and have multiplied considerably during this transitional period in dental education. The scope of its work, the value of its accomplishments and its future usefulness in dental educational activities are intimately related to the widespread interest of both the profession and the schools in the solution of dental educational problems. Moreover, it is generally conceded that the initial classification in 1918 of the dental schools of this country was the beginning, and, so to say, the direct cause of a development that is reflected in the unusual interest in dental education at the present time. Recent advances and improvements in dental education, as a whole, are eminently constructive and, in many respects, even epochal, owing to the unified effort of all the progressive forces in dentistry.

The Universities and Dental Education

To the end that dentistry may strengthen its position as an indispensable department of health service, and may attain, not in name only, but in reality as well, the full stature of the specialty of oral medicine, the Council looks to the future with the hope of an increasing interest on the part of boards of trustees of universities in the problems of their dental schools; and again, the Council trusts that an early recognition, by medical and dental teaching faculties, of the importance of cordial union and effective cooperation, will lead to results of enduring value. It is the hope of the Council that these agencies will realize fully their obligations to the student and to the public and will assist with whatever of sympathetic and constructive help they can toward the development of their dental schools, so that these may continue in the vanguard of progress.

In view of the gradual, yet effective, elimination of commercialism from dental education and of the impending extinction of independent schools in dentistry and the consequent complete control of dental education under university ideals and auspices, and because the university has become the most important and powerful instrument for the promotion of higher education, the Council should give attentive consideration to the quality of a university relationship and to the attitude of its trustees and medical officers toward dental education in evaluating the educational worth of a school. The necessity for closer cooperation between schools of medicine and schools of dentistry is apparent; for the glaring deficiency in dental education today is the failure of schools generally to develop a medical outlook in the mind of the dentist. A wider conception and more vigorous growth of this aspect of dental training and teaching is imperative, if dentistry is to maintain an assured position as a branch of health service.

Universities should give adequate sup-

port to their dental schools both financially and educationally. The salary scale should be on the same basis as that in the schools of medicine, since the opportunities for monetary reward in the practice of dentistry today are equal to those in medicine. Formerly, this was not the case. Commercialism and inferior types of educational understanding, whether countenanced by independent schools or by others enjoying a sense of security on account of affiliation with or as an organic part of a university, are not in accord with the highest ideals of university education. Moreover, the common, though erroneous belief that university control always implies the endowment of sound learning has no influence on the Council's decisions, for merit alone is the basis upon which schools should be classified.

Practices of Certain Universities

Mercenary tendencies; inadequate financial support; lack of proper educational guidance; selfish utilization of resources; indifferent or negligible cooperation; faulty organization; autocratic administration; unscientific and archaic methods of teaching—these are some of the conditions to be found in certain universities today that are obstructing the development of better dental service to the public.

The policy of utilizing dental student and infirmary fees to support famished medical schools; the exaction of interest payments on loans to dental schools by universities, to be paid for from the same sources; the stray-child attitude of boards of trustees of universities toward their dental schools; the exploitation of dental education in the form of high rentals and other such practices; the exclusion of dental schools in health service developments; the failure of dental and medical faculties to cooperate loyally in the coordination and correlation of medical and dental teaching and their indifference to a progressive dental education program should receive the condemnation they deserve.

It is, therefore, the plain duty of the Council so to apply its standards and exercise its executive function that universities may not notoriously neglect nor wretchedly support their dental schools.

The schools should be notified promptly that the past policy of the Council in viewing conditions of this kind liberally, possibly passively, has been due to the exigencies of a condition prevailing during a reconstructive period, and that these practices will have no place whatsoever in the new era of dental education.

Predental Year

Establishment of the predental year by the Council in 1926 as one of the requisites for a Class A rating was viewed with alarm because of the fear that a a sufficient number of dentists might not be graduated to take care of the growing need of the people of this country. The action of the Council at this meeting requiring a college foundation for Class B as well as Class A schools is in keeping with standards set by all the learned professions. The increasing number of men who seek a college education, as shown by the fact that all the colleges have increased registration, approximately 300,000 being students in colleges today; the awakening of the public to the importance of teeth in health and disease; the future position of dentistry as an agency in health service; the financial rewards for a high degree of skill; the demands of hospital authorities for effective cooperation between dentists and physicians, and the necessity for closer coordination in the medicodental relationships of education point clearly to the success of a five-year training plan, which will develop a mind to conceive and a hand to execute.

The "2-3 Graduate Plan"

Hearty support should be given to the trial of the "2-3 graduate plan of dental education" as presented by Dr. Gies.

This plan proposes two years of work in a liberal arts college of standard grade, consisting chiefly of academic studies upon which is to be built a three-year course of dental study, to consist partially of academic studies, for the dental degree, for the general practitioner of dentistry. The various dental specialties are to be taught in detail in full-year graduate curriculums to those who might elect them, with commensurate higher degrees in recognition of this graduate work.

Revision of the Council

The Council believes that, for the present, its size should remain as it now is, and at the end of two years it should be reduced in number if necessary.

Representation in the Council from the Association of American Universities

The suggestion that there be included in the membership of the Council a representative from the Universities Association especially interested in dentistry and in sympathy with its educational program should appeal to all. With a representative from this organization in the Council, one of the marked advantages accruing to its work would be the effective and material assistance offered in promoting the quality of university relationship and in eradicating or preventing many or most of the evils alluded to previously in this report.

Meetings of the Council

During the past year, the Council has held two meetings, one at Cleveland in September, 1923, and the other at Chicago in March, 1924. Four schools have been officially reinspected and two of these have been granted a Class A rating, the University of Tennessee College of Dentistry and the North Pacific College of Oregon. Careful consideration has been given also to those schools that are listed in the postponed classification. The University of California Dental Department has been placed in Class A and the College of Physicians and Surgeons of San Francisco in Class B. Informal inspections have been made of other schools for the purpose of offering suggestions and comments and pointing out deficiencies.

During the next year, the remaining schools in the postponed list should be definitely classified, and schools in the lower range of Class A and B reinspected. The Council has assisted graduates of schools in the postponed list by securing the practical cooperation of state examining boards in having rules modified that called for examination of Class A and B schools only.

Council on Medical Education

In the Council's study of dental education, it has become evident that the interrelationship between medical and dental education is becoming increasingly more intimate and in time must result in closer reciprocal relations between the two professions in their common service. It is evident that there are some points of view in regard to the relation of the operation of medical and dental teaching in a single university or community in which the local medical and dental factors are not fully in accord. The Council believes that closer cooperation between the two major advisory forces of medical and dental education is essential to progress in order that cooperative effort in teaching and other educational procedures may be secured in all localities. The Council presented its views in this relation to the Council on Medical Education, and, as a result, Dr. Henry L. Banzhaf, of Milwaukee, a member of the Council, read a paper before the Medical Congress, in March, 1924, entitled "Cooperation Between Dental and Medical Education: An Essential for Progress in Health Service." It is the ardent wish of the Council that activities in this relationship may be continued for the advance of dental and medical educa-

tion, and hence for the health of the community.

National Board of Dental Examiners

A national board of dental examiners advisory to the National Association of Dental Examiners should be created to function along lines similar to those of the Confederation of Medical Examining Boards. Such a body might assist constructively by raising the personnel and improving the activities of the various state dental examining boards; by elevating the quality of dental licensing examination generally; by promoting accord between the schools and examining boards, and by adding force and value to tabulations.

Model Dental Law

To keep pace with progress and to meet changing conditions, dental statutes in certain states should be revised and improved. A model dental law, formulated by the National Association of Dental Examiners, should be a guiding and most helpful influence for meeting these desirable changes.

Funds for the Council

The council should have adequate funds to secure the services of a full-time executive secretary and to meet expenses incident to its activities. May not the Council receive practical consideration in this relation in order to keep pace with the rapid march of unusual progress?

The Council looks forward confidently to substantial improvement in its standards and continued progress in its activities. It seeks the cordial cooperation of all good influences in and out of dentistry for the promotion of dental education and believes the intensive efforts of the past three years will result in better educated and better trained dentists, who may render health service to the community on a basis equal in all respects to that of any of the learned professions.

Financial Report of Committee

November 4, 1924.

Dr. Albert L. Midgley,
315 Butler Exchange,
Providence, Rhode Island.

Dear Sir:

Following your instructions I have examined the books of account of the Dental Educational Council of America, Dr. Albert L. Midgley, treasurer, and present herewith a statement of cash receipts and disbursements for the period Sept. 6, 1923 to Oct. 31, 1924 and a statement of assets as of Oct. 31, 1924. I hereby certify that the accompanying statements are true as revealed by examination of said books of account.

Respectfully submitted,

George M. Rex,
Certified Public Accountant.

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS

September 6, 1923-October 31, 1924

Balance on hand, September 6, 1923			$ 66.50
Receipts			
State Boards	125.00		
Dental Schools for Inspection	2,412.88		
American Dental Association	2,500.00	5,037.88	
Interest on Liberty Bonds	38.92		
Interest on Bank Deposits	4.45	43.37	
Sale of Liberty Bond		993.13	
Total Receipts			6,074.38
Total Cash			$6,140.88
Disbursements			
Travel Expense for Council Meetings		1,359.75	
Travel Expense for Inspection Trips		1,355.28	
Travel Expense for Committee Work, etc.		514.85	
Printing, Stenography and Supplies		711.36	
Postage and Express		133.94	
Telephone and Telegraph		385.42	
Professional Service		81.50	
Administrative Expense		1,400.00	
Miscellaneous Expense		26.35	
Total Disbursements			5,968.45
Balance on hand, October 31, 1924			$ 172.43

STATEMENT OF ASSETS

October 31, 1924

Cash on Hand	172.43
Typewriter	114.00
Filing Cabinet	59.00
Table	6.00
Total Assets	$351.43

DEPARTMENT OF DENTAL HEALTH EDUCATION

THE OBLIGATION OF THE PROFESSION TO THE FACTORY WORKER

By E. L. PETTIBONE, D.D.S., Cleveland, Ohio

(Read before the American Dental Association, Dallas, Texas, November 10-14, 1924)

IN our early work in teaching mouth hygiene we concentrated our efforts on teaching children to care for their mouths, reasoning that we would be accomplishing about all we could expect to accomplish if we succeeded with the coming generation. But the instruction of the children was taken up by the schools universally, and so successfully that we dental instructors looked about for other fields for our efforts.

We soon realized the advantage of reaching large groups through their places of employment. We were urged to reach the factory worker with our mouth hygiene message, by the officers of the National Safety Council, who offered us the use of their bulletin service, reaching millions of workers in the United States. These bulletins accomplished much good.

Later, during the early part of the War, when many plant dental dispensaries were established, carrying of the message to the factory worker was accomplished much more thoroughly and efficiently by the factory dentist. The plant dental dispensary was an offspring of the plant medical dispensary, the forerunner of which was the "mine doctor" and the "camp doctor," employed by the mining company or the lumber company because of their separation from civilization.

The medical department of the industrial plant has tremendously expanded from its beginning with simple first aid treatment, until, in the best plants, it includes, besides the dental dispensary, the clinical dispensary, the emergency hospital, the care of the visiting nurses, examination of prospective employes, periodical examination of employes, factory inspection, educational work, safety work, sanitary care of the plant, treatment and education of the families of employes at home.

The compensation laws have been largely responsible also for the establishment and maintenance of the medical department. During the stress of the War, almost every factory of any size established a medical dispensary, and the dental dispensary was soon added. There is a point where a factory becomes so large that it is really more than a factory—it is an institution. When this stage of development is reached, a dental dispensary is a recognized adjunct. The number of these dental dispensaries has steadily increased until we now have approximately 160 plant dental dispensaries scattered throughout the United States and Canada. These are in all

types, classes and kinds of industries employing all classes of employes. They are found in the industries manufacturing rubber goods, locks, plumbing material, sporting goods, electric lamps, radiators, soap, electrical appliances, shoes, motor cars, rope, optical goods, cash registers, children's garments, men's clothing, machinery and pulleys.

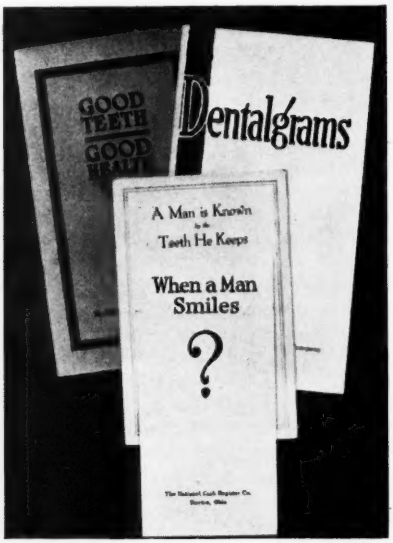

Fig. 1.—Dental health literature put out by an industrial concern.

There are dental dispensaries operated for the employes of department stores, raisin growers, insurance companies, cotton mills, knitting mills, meat packers, flour mills, power companies, oil refineries and tobacco growers. There are dental dispensaries conducted by trade unions in the shirt, suit, skirt and dress industries; and by the painters' union. There are dental dispensaries conducted for only the children of the employes, and there are others who treat the children and the employes. There are dispensaries treating white and colored employes; and in many of the clinics people of all races and most nationalities are treated. Some clinics are used for officials and office employes only; and there are others in which only factory workers receive treatment.

These plant dental dispensaries are directed by the most enthusiastic teachers of mouth hygiene in the country. Their efforts have produced some of the best and most appealing literature on preventive dentistry, and this literature has been freely given to the dental profession and is used by mouth hygiene workers in their efforts to reach the laity. I wish to call attention to just a few examples: "Good Teeth—Good Health" and "Dentalgrams," issued by the National Cash Register Co.; "Theodore Roosevelt's Teeth," and "A Man Is Known by the Teeth He Keeps," issued by the B. F. Goodrich Co. This material has been produced with the help of the advertising department usually, and is appealing, attractive and accurate. It is usually cleverly illustrated, and its value is easily recognizable. "Good Teeth—Good Health," issued by the National Cash Register Co. is representative of them all. It is a four page booklet, the object of which is to arouse a greater interest in the study of mouth hygiene, and to present a few facts about the teeth and mouth. The material presented is from the writing of men who are authorities on subjects pertaining to dentistry and research work. There is one chapter on the care of children's teeth which is most excellent, and there are paragraphs on cleaning teeth, use of dental floss, pyorrhea, focal infection, diet, etc. The booklet also contains some very interesting pictures. Those showing the right way to brush the teeth and how to use dental floss are especially good.

Many plants have a factory publication for employes, and the plant dentist contributes instructive and helpful articles on preventive dentistry. A message taken home by the wage earner

carries weight with the entire household, and its lessons are more sure of being followed than those from any other source, not excepting those from the schools.

I shall not burden you with a long story about plant dental dispensaries, nor about their value in keeping down the labor turnover, their actual value in dollars and cents to the plant, their value to employe and employer, all of which has been proved elsewhere; but I hope to interest you, the members of this section, the alert members of our profession, who are ready and willing to teach preventive dentistry, in the great opportunity you have with those employers who have not as yet installed plant dental dispensaries. You can probably, every one of you, call to mind right now at least one employer of labor whom you could interest. Preferably, he should be a patient for whom you have worked and to whom you have taught mouth hygiene, thereby making it possible for him to keep his teeth in better condition. He may be a personal friend, a business acquaintance or a relative who respects your professional knowledge and good judgment, and who appreciates the value of mouth hygiene.

Resolve right now to take back from this meeting a determination to sell this idea of a plant dental dispensary and its valuable lessons in efficiency, and good health, to that employer and you can do it. If there is anything you lack in the way of facts, figures or inspiration and enthusiasm, you can obtain it by a visit to the health exhibit and by making a few inquiries.

Don't attempt this if you have in mind getting a job. You can't get a job out of it. I am appealing only to those who are interested in this idea of teaching mouth hygiene, and who are

One of the Secrets of Good Health is a Clean Mouth,
—Clean Teeth and Firm Gums
PYORRHEA (Riggs' disease) is a disease of the gums. It is caused, usually, by tartar accumulating on the roots of teeth. Tartar breaks down the gum tissue—infection follows and the tooth support is destroyed—the teeth loosen and fall out.
Tartar will accumulate if the teeth are neglected.
Examine this picture. It shows how tooth sockets are destroyed as a result of pyorrhea.
Diseased Teeth and Diseased Gums Cause Diseased Bodies
Keep Your Teeth Clean and Your Gums Hard by Vigorous, Systematic Brushing with Tooth Powder or Paste Twice Daily

Fig. 2.—Bulletin published by National Safety Council.

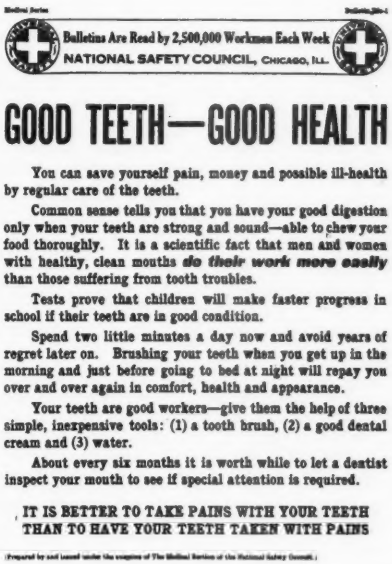
Bulletins Are Read by 2,500,000 Workmen Each Week
NATIONAL SAFETY COUNCIL, CHICAGO, ILL.
GOOD TEETH—GOOD HEALTH
You can save yourself pain, money and possible ill-health by regular care of the teeth.
Common sense tells you that you have your good digestion only when your teeth are strong and sound—able to chew your food thoroughly. It is a scientific fact that men and women with healthy, clean mouths do their work more easily than those suffering from tooth troubles.
Tests prove that children will make faster progress in school if their teeth are in good condition.
Spend two little minutes a day now and avoid years of regret later on. Brushing your teeth when you get up in the morning and just before going to bed at night will repay you over and over again in comfort, health and appearance.
Your teeth are good workers—give them the help of three simple, inexpensive tools: (1) a tooth brush, (2) a good dental cream and (3) water.
About every six months it is worth while to let a dentist inspect your mouth to see if special attention is required.
IT IS BETTER TO TAKE PAINS WITH YOUR TEETH THAN TO HAVE YOUR TEETH TAKEN WITH PAINS

Fig. 3.—Bulletin published by National Safety Council.

big enough and broad enough to want to help the workers of their community by getting good dental service for them. Maybe you could even succeed in getting a clinic for the children of the employes. There are several of these. If you have the vision and a little enthusiasm, there is no reason why you should not.

Look at the results of one such vision, that of a dentist practicing in the hills of West Virginia (McDowell county). He was the family dentist of one of the large coal operators in West Virginia. He succeeded in interesting his patient in the idea of dental clinics for the children of his employes. The first clinic, which was started seven years ago, was run for one year as an experiment, and it was so successful that the company established clinics to care for all dental work for children up to 16 years of age, including children of preschool age. After these clinics were run for two years, they became so successful and popular that the people of McDowell County had a bill passed in the state legislature, authorizing a referendum vote on the proposition of laying a tax levy to conduct dental clinics, i. e., to do all the dental work for all the resident children up to the age of 16 years. This was submitted to a vote of the people and carried by a large majority. It authorized the county court to levy a tax to operate the clinics. These clinics have been in operation now for four years, and the results already attained by the work done for the children have increased the attendance in the schools, improved the progress of the children and decreased the number of retarded children. The attendance of the schools has been increased 20 per cent, and at Mayberry, where the clinic has been in progress seven years, the attendance has been increased 30 per cent. The attendance at Mayberry now averages 99 per cent throughout the school year. Illness of school children has been reduced 50 per cent in the industrial clinics that are operated by the coal company.

Fig. 4.—A typical industrial dental dispensary.

There are about 160 schools in this county, and many of them are reached only by the dentist with a portable outfit, which must be carried in an auto-

mobile or sometimes by wagon because of the condition of the mountain roads. The result of this work has been so successful that, in Buchanan County (adjoining), a clinic has been established to do the same work in the same way.

The tax levy in McDowell County was 10 cents on each $100 valuation; but it has been reduced now to 5 cents on each $100. Thus, as you can see, this type of service is very economical.

If there are any of you who are not so thoroughly established that you are still building for the future, you may render service to some factory worker which will be not only greatly appreciated by him, but will be of profit to you as long as you are in practice.

About twenty years ago, I had as a patient an immigrant girl, and I taught her one mouth hygiene lesson. She married a factory worker, a mechanic, and today they live on one of the better streets in one of our suburbs. Their children, a boy and a girl, if judged by our usual standards—looks, actions, speech—are as good Americans as the children of any of us whose forefathers have been in America over a century. The mother's mouth hygiene lessons have been rigidly enforced, and it is a pleasure to work for the family.

Remember, too, that many of the workers of today are the executives of the future. They are the backbone of our country, and were recognized in the last national campaign as a factor to be considered even as is the farmer.

Many, if not all, of you have established yourselves among the more prosperous people of your community. You appreciate your obligation to the public and especially your neighbors because of your professional training, and because of what you know about the value of preventive dentistry. We do not believe that you are obligated actually to give personal service to the worker, his children or your neighbors; but we believe that your opportunity and obligation is to secure service for him by reason of your standing in the community and because of your influence with those whom you do serve, who can be convinced of the economic value of industrial dentistry. You owe something to the rest of the community. To pay that obligation, use your influence with those of your patients who are factory operators. If good dentistry is good for the rich man, it is good for the poor man, who has just as much right as anyone to enjoy good health and happiness in old age.

Who of you would not be proud to know that you were responsible for the establishment of such a permanent source of benefaction—a community dental service, an industrial dental clinic in one of your city's industrial institutions? Would that not be a fitting monument after a busy professional life?

Discussion

Guy S. Millberry, San Francisco, Calif.: Dr. Pettibone mentioned in the early part of his paper that we had probably reached the acme of success or accomplishment in our work with school children, at least, such a degree of success that dental enthusiasts had to take up another phase of clinical work—the industrial problem. I commend his point of view from one standpoint, and that is that he has found a new opportunity to carry this work on, but I do not believe by any means that he has solved the problem of the school's dental clinic, because we have constantly confronting us the problem of expanding that work until it reaches all classes of people in the public schools, or at least all types of school children. Many communities throughout the United States are still lacking in fundamental knowledge as regards that problem, and therefore we should not neglect them. There is, however, the other aspect of the problem: a group of the children is being reached through the parents who work in these various industrial plants, and the messages are carried to their children through a type of parental influence that does not prevail in the ordinary practice of the ordinary dentist of today. In other words, the poor little rich girl is suffering sadly for the lack of dental care because her mother and father are wholly disinterested in her, passing her education and development entirely to the nurse or governess; whereas, the parents of

these less wealthy are charged with an economic responsibility, and if they can keep their children well, they are going to insist on their having proper care and attending to their teeth in order that their savings can be increased and the economic cost be materially reduced. The value of organized business or the business efficiency that results from business organizations is manifest through everything that they do, and in this field of endeavor. They understand better how to attack the problem of establishing clinics, maintaining them, establishing measures for their future welfare and conducting their advertising work; which we could not do so publicly in schools or in our own practices. Therefore, they can carry their messages along in a far more satisfactory manner than we can in the general field of professional practice. If any one of us were to circulate such pamphlets as have been circulated here and appended our name to them, we would immediately be charged with a violation of the Code of Ethics of the American Dental Association. But the B. F. Goodrich Company can circulate that in the name of its own clinic, or the Metropolitan Insurance Company can circulate any information it wishes to under its name, and it is accepted as one of the most valuable aids that we have in carrying on this work in mouth hygiene. I was struck with the fact that there are so many institutions carrying on this work, and I recall a time, only a few years ago, when the Colorado Fuel and Iron Company in Colorado, under J. Pierpont Morgan, Jr., had the best equipped hospital and the best equipped dental dispensary and was doing better work for their employes than any other institution in the State of Colorado; and it is surprising that a private institution or a private industry would have better hospital facilities than the great public institutions that the community and the state are supposed to maintain. The influence of this type of preventive dental instruction is beyond our comprehension. I do not know whether Dr. Pettibone has ever determined the number of workers who are engaged in industry exclusive of the agricultural field, but if those statistics were before us, and if we adopted the plan that he has suggested, that each one of us carry on a field of endeavor in our particular districts or particular states, we could readily tell how many industrial workers and how many children we could reach through such channels. And again, my own experience has been in the West where it is important that whoever starts a problem of this sort see it through. It is not advisable for any one individual to present a paper or a discussion to a manager of a plant or to the president of a plant and say "Here is a very nice little problem on paper," and receive that man's appreciation for it, and then call the job all done. The individual who starts any type of industrial activity or any type of school clinic activity in any county has got to carry that thing on and see that it is carried on until such time as the community itself or the industry itself accepts the entire responsibility; because there are pitfalls and hazards all along the line, and if it is dropped merely at the presentation of the plan, then the project is a failure, and the persons who made the original investment and expended the money to establish the clinic realize that it is not satisfactory in any sense whatever, and they drop the project, and it is difficult to bring them to any conception of the importance of the subject.

Thaddeus P. Hyatt, New York City: I would not ask anybody in this room to go out and try to arouse any interest in any of the industries for this work. I would not do it myself. I disagree with Dr. Pettibone. The reason I would not ask anybody here to go out and try to interest any of the industries is the fact that this room is not filled with dentists. I am proud of my profession, but that does not prevent me from criticizing it. The profession as a profession has not awakened to the realization of two tremendously important factors that, if brought into execution, would raise it as high, if not higher than any profession of the healing art in the world. The question of mouth hygiene and mouth conditions is absolutely the first logical step in any health work. The value of the community amounts to nothing without the human being, and the value of the human being depends on his health and his health depends largely on the conditions of his mouth, and we, as guardians of the portal of health, when we fulfil our full function, will be recognized as the most important workers in the most important field of human life and health and happiness. I think the problem of industrial dentistry depends largely on the support that it will receive from the profession as a whole. I have been in this campaign and have been enthusiastic over this oral hygiene campaign for the last twenty-five years, and naturally I want the Metropolitan to spend a great amount for oral hygiene, and I keep going constantly to them with reports of different communities where dental work is done, and they have rejected them because the work has not been done along scientific lines for statistical purposes. Now these industries, wherever they are, have the greatest opportunity, greater than any practitioner has, for securing dental statistics, and that is what we need, and once we can secure dental statistics we can do anything we want. We

can get it into all of the schools, we can get it into every one of the industries, so I beg of you all, and I beg of Dr. Pettibone in his close association with industrial dental clinics to try and work out a plan whereby we can get dental statistics.

P. S. Turner, Belton, Texas: I am practicing in a strictly agricultural country. We have very few industrial plants in my section of the country. I hope that this association will take some action to reach the agricultural people, the people of the rural districts. We are hampered by dental ethics about instructing or giving out instructions. As Dr. Millberry said, if we would send out this propaganda with our name attached we would be put out of the Association, but let the Association come forward and put out literature with its own signature to it, so that we can distribute it in the rural districts. In that way I believe a great good can be done in the agricultural districts, where we cannot put into operation the industrial methods of treatment and instruction.

T. B. Wright, Hattiesburg, Miss.: One point that went home to me, as being in line with my experience and general practice is that when a man allows us to give his mouth a thorough cleaning, and we give him a little educational talk he will say, "Well, I am determined to see that my children's teeth are better cared for than mine were."

Dr. Pettibone (closing): For the benefit of Dr. Turner, I would say that there is operating here in Dallas a dental dispensary in the department store of A. Harris & Company, and I am sure that he or any of you who care to see an industrial dental dispensary in operation will greatly profit by a visit to this dental dispensary and getting in touch with Dr. Moore, their operator; and I am sure that if there is a dental dispensary in some plant in your community it will be only one step farther to use their literature under the endorsement of your county or local dental society. This has been done in some of the other communities where they have industrial dental dispensaries.

LIST OF INDUSTRIAL DENTAL DISPENSARIES*

FIRM NAME	LOCATION	DENTAL DIRECTOR
T. Eaton Co., Ltd.	Winnipeg, Canada	Dr. C. H. Vromain
Colorado Fuel & Iron Co.	Pueblo, Colo.	Dr. E. W. Varley
Yale & Towne Mfg. Co.	Stamford, Conn.	Dr. I. D. Beebe
The Travelers Insurance Co.	Hartford, Conn.	Dr. E. S. Arnold
The Travelers Insurance Co.	Hartford, Conn.	(4) Dental Hygienists
Joseph Bancroft & Sons Co.	Rockford, Wilmington, Del.	Dental Director
Electric Hose & Rubber Co.	Wilmington, Del.	Dr. R. H. Maris
Associated Raisin Growers	Selma, Calif.	Dr. G. R. White
Associated Raisin Growers	Selma, Calif.	Dr. H. L. Shannon
Associated Raisin Growers	Lemoore, Calif.	Dr. Cobb
Associated Raisin Growers	Hanford, Calif.	Dr. Campbell
Associated Raisin Growers	Kingsburg, Calif.	Dr. Fahlgnen
Associated Raisin Growers	Kingsburg, Calif.	Dr. C. C. Kolander
Associated Raisin Growers	Fresno, Calif.	Dr. Dahlfnen
Associated Raisin Growers	Dinuba, Calif.	Dr. M. H. Hagcraft
Fulton Bag & Cotton Mills	Atlanta, Ga.	Dr. F. E. Cook
Sears, Roebuck & Co.	Chicago, Ill.	
Armour & Co. and Morris & Co.	Chicago, Ill.	Dr. G. J. Heyboer
International Harvester Co.	Chicago McCormick Plant	Dr. R. I. Humphrey
International Harvester Co.	Chicago West Pullman Plant	Dr. J. Lace
International Harvester Co.	Chicago Wisconsin Steel Plant	Dr. Murray
Phoenix Knitting Works	Milwaukee, Wis.	Dr. H. F. Heidelberg
Phoenix Knitting Works	Milwaukee, Wis.	Dr. A. J. Noetzell
Kohler Co.	Kohler, Wis.	Dr. G. J. Kent
D. H. Holmes Co.	New Orleans, La.	Dr. G. W. Duboisson
John Hancock Life Ins. Co.	Boston, Mass.	Dr. F. E. Dimmitt

*Compiled by the National Association of Industrial Dental Surgeons.

This list is as nearly complete as it has been possible to make it. Omissions, additions or corrections should be sent to the American Dental Association.

FIRM NAME	LOCATION	DENTAL DIRECTOR
Hood Rubber Co.	Watertown, Mass.	Dr. R. R. Rich
Hood Rubber Co.	Watertown, Mass.	Dr. B. A. Mellen
Farr Alpaca Co.	Holyoke, Mass.	Dr. O. E. Demarest
Norton Co.	Worcester, Mass.	Dr. E. P. Brigham
U. S. Rubber Co.	Malden, Mass.	Dr. S. A. Clayes
National Equipment Co.	Springfield, Mass.	Dr. F. M. de St. Quay
Gilchrist Co.	Boston, Mass.	Dr. R. N. Hopkins
Dennison Manufacturing Co.	Framingham, Mass.	Dr. C. E. Stewart
The Fisk Rubber Co.	Chicopee Falls, Mass.	Dr. W. E. Moore
Jordan Marsh Co.	Boston, Mass.	Dr. H. L. Peacock
A. G. Spalding Co.	Chicopee Falls, Mass.	Dr. T. F. Kirby
R. H. White Co.	Boston, Mass.	Dr. E. Bradway
Babson Statistical Organization	Wellesley Hill, Mass.	Dental Hygienist
Walworth Manufacturing Co.	Boston, Mass.	Dr. C. C. Severy
Walworth Manufacturing Co.	Needham, Mass.	Dr. C. A. Forbush
Walworth Manufacturing Co.	Boston, Mass.	Dental Hygienist
William Filene Co.	Boston, Mass.	Dr. J. E. Coleran
National Lamp Co.	Harrison, N. Y.	Dr. J. M. Perelman
Washburn-Crosby Co.	Buffalo, N. Y.	Dr. E. T. Butler
Buffalo Miniature Lamp	Buffalo, N. Y.	Dr. A. H. Boysen
American Radiator Co.	Buffalo, N. Y.	Dr. J. R. Hawn
Larkin Co.	Buffalo, N. Y.	Dr. R. L. Hussong
Solvay Process Co.	Detroit, Mich.	Dr. W. R. Muyskins
National Lamp Co.	Minneapolis, Minn.	Dr. L. A. Harker
B. Nugent Bros.	St. Louis, Mo.	Dr. B. A. Rice
Stix, Baer & Fuller Co.	St. Louis, Mo.	Dr. O. I. Bird
Century Electric Co.	St. Louis, Mo.	Dr. E. G. Sprick
General Electric Co.	St. Louis, Mo.	Dr. H. W. Wellman
Union Electric Light & Power Co.	St. Louis, Mo.	Dr. H. Bloch
Joint Board of Sanitary Control	New York, 131 E. 17th St., N.Y.	Dr. Max Price
Joint Board of Sanitary Control	New York, 601 W. 175th St., N.Y.	Dr. B. M. Warren
Joint Board of Sanitary Control	New York, 717 Croyona Pk., N.Y.	Dr. L. Epstein
Joint Board of Sanitary Control	New York, 795 8th Ave., N. Y.	Dr. A. Bluminthal
Joint Board of Sanitary Control	New York, 1425 Grand Concourse	Dr. J. Baiko
Joint Board of Sanitary Control	New York, 992 E. Pkwy. Bldg., N. Y.	Dr. I. Bobrane
Joint Board of Sanitary Control	New York, 33 W. 42nd St., N.Y.	Dr. H. B. Silver
Joint Board of Sanitary Control	New York, 463 Koscioski St., N.Y.	Dr. A. Kaplan
Joint Board of Sanitary Control	New York, 1231 Stebben Ave., N. Y.	Dr. R. Fogelson
Metropolitan Life Insurance Co.	New York, N. Y.	Dr. T. P. Hyatt
Metropolitan Life Insurance Co.	New York, N. Y.	Dr. A. M. Hunter
Metropolitan Life Insurance Co.	New York, N. Y.	Dr. E. Hoffmire
Metropolitan Life Insurance Co.	New York, N. Y.	Dr. Sarah Browman
R. H. Macey and Co.	New York, N. Y.	Dr. A. D. Hequembourg
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R. H. Macey and Co.	New York, N. Y.	Dr. C. H. Sachse
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Endicott, Johnson Co.	Johnson City, N. Y.	Dr. H. Niles
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FIRM NAME	LOCATION	DENTAL DIRECTOR
General Motors Research Corp.	Dayton, Ohio	Dr. D. Reese
The U. S. Playing Card Co.	Norwood, Ohio	Dental Hygienist
National Lamp Co.	Cleveland, E. 152 St. Ohio.	Dr. M. F. Wielage
National Lamp Co.	Cleveland, E. 45 St., Ohio	Dr. J. Miller
National Lamp Co.	Cleveland, Nela Park, Ohio.	Dr. E. E. Belford
The Kaynee Co.	Cleveland, Ohio	Dr. F. G. Thompson
Joseph & Feiss Co.	Cleveland, Ohio	Dr. G. D. Haggerty
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The Halle Brothers Co.	Cleveland, Ohio	Dental Hygienist
National Lamp Co.	Youngstown, Ohio	Dr. T. J. Evans
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Kaufman's Store	Pittsburgh, Pa.	Dr. H. Erney
J. G. Brill Co.	Philadelphia, Pa.	Dr. O. C. Hayes
The American Pulley Co.	Philadelphia, Pa.	Dr. J. Mackin
The Aberfoil Co.	Chester, Pa.	Dr. C. A. Bogart
The Barrett Co.	Frankfort, Pa.	Dr. C. G. Perez
Berkshire Knitting Mills	Reading, Pa.	Dr. Rees Davis
Berkshire Knitting Mills	Reading, Pa.	Dr. Fred Herbine
Berkshire Knitting Mills	Reading, Pa.	Dr. O. J. Specker
Berkshire Knitting Mills	Reading, Pa.	Dental Hygienist
A. Harris & Co.	Dallas, Texas	Dr. Moore
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Virginia Lead Mine Co.	Austonville, Va.	Dental Director
Whitlock Tobacco Co.	Richmond, Va.	Dental Director

MOUTH HYGIENE IN MISSISSIPPI

By BOWDEN HUDSON,* Jackson, Mississippi

WE do not feel in Mississippi that we have found a satisfactory solution for the mouth hygiene problem. Our methods have necessarily been elementary; and we know that we are touching only a fractional part of the vast field. Therefore, this paper has nothing of an advisory nature. It is a brief statement of the manner in which the work is being done.

Until January, 1922, there was no organization of mouth hygiene activities in the state. Many dentists and teachers were doing notable pioneer work before this time. An outstanding example was the work in the Jackson schools under the direction of Miss Gladys Eyrich, supervisor of physical education, who was constantly and ably assisted by the local dentists, one of whom, Dr. W. R. Wright, is chairman of the American Mouth Hygiene Council. Much impetus was gained through the work of the public health physicians and nurses. Many counties gave complete physical examinations to all school children. The care of the mouth was stressed after these examinations, and literature was sent into the homes.

In January, 1922, a division of mouth hygiene was created in the bureau of child welfare of the state board of health. A supervisor was put in charge of this division, and an advisory council of three dentists was appointed

*Supervisor, Division of Mouth Hygiene Mississippi State Board of Health.

from the state dental association. It gave one a helpless feeling to take charge of work that vitally concerned more than a half million school children, to say nothing of those of preschool age and the adults. We felt much as did Hamlet when he was trying to decide whether it was better to be or not to be. The way was uncharted. There was no plan. We wanted to proceed in the manner that would insure the greatest efficacy and permanency in the work.

In analyzing the situation, we considered first the adult. He needed information. But his habits were already formed, and the results of neglect were present. However, we decided on a general publicity program for him. This has consisted of three series of articles in our 120 county newspapers. One series was from Dr. Magee, one from the Dental Welfare Foundation and one from the Southern Academy of Periodontology, in Birmingham, Ala. We checked up on the first series sent and found that seventy-five of the 120 papers ran the series complete. In addition to this, there have been exhibits at several county fairs over the state. A series of five articles was written by one of our dentists for the Mississippi Parent-Teacher Association magazine. (Mississippi is the only state in the union that has such a magazine.) A bulletin "Watch Your Teeth" has been written for grown-ups.

Wide circulation has been given to a poster which has been sent to the county sheriffs, health officers, public health nurses and superintendents of education, all members of the state dental association, home economics teachers, parent-teacher association presidents, practically all schoolrooms, a number of postoffices and also to 270 railroad stations. A few days ago, in one of our largest railroad stations, I saw a well-dressed man look at this poster, start hurriedly to the ticket window, stop, go back and read the whole poster. He lingered after reading to sum it up. His attitude was one of intelligent interest.

It is impossible to reach the preschool child in number with no help. We have used the bulletins "How to Build Sound Teeth" and "Children's Teeth—How to Use and Keep Them." At meetings of the parent-teacher associations, the matter of proper food is stressed, along with keeping the temporary teeth in good condition from the beginning. In the bulletin "Watch Your Teeth," a paragraph is devoted to the effect of food on the teeth.

It is with the school children that we have spent most of our effort. The reasons are obvious. They are grouped and can be reached in large numbers, and it is true beyond question that what you would have come out in the life of a nation, you must first put through its schools. We have gone about the school work in this way. When the division was first organized, the supervisor talked to the teachers at a meeting of their state association, explained to them the plan and asked for their help. For the past two summers, we have talked to the teachers' normals, this summer speaking to 2,000 teachers. We mailed a copy of Dr. Fones' "Five Years of Mouth Hygiene in the Bridgeport Schools" to each of 125 superintendents.

The first plank in our platform, so to speak, is to establish the habit of yearly dental inspection and corrective work in our larger school systems. Some of them are now putting this on for the third consecutive session. In doing this, the first thing is to secure the interest of the superintendent of the schools and the local dentists. When the plans have all been completed for a school examination, the teachers are told when the dentists will come and are given an inspection chart on which to make their rolls. The teacher checks the findings of the dentist on this chart as he works, and places it on the wall of the school-

room after the examination is over. A follow-up letter is sent by the teacher to the parents of each child who has defective teeth. When the teeth are "okeh" at inspection, a star is placed in the "okeh" column. When all defects are corrected and the pupil brings a certificate from the dentist, he gets a star also. Anyone who has ever taught children will understand that the stars and the chart are good teaching psychology. Often, the school offers a prize to the grades getting all corrections made. Sometimes a prize is offered to the first school getting all of its corrections made. During the last session, eight schools in the state made 100 per cent. Two lacked only two pupils each; and many schools had more than 75 per cent of their corrections made. The division of mouth hygiene supplies the forms for these examinations.

After the examinations have been made, the supervisor checks up the findings and talks to the children. This has been a very satisfactory contact. We always try to have illustrations for the stories and have found the reaction of the children encouraging. In these talks, we stress the importance of food; the kinds of foods, and daily and dental care of the teeth. We have tried to have no school lapse in these yearly examinations and have succeeded rather well. Last year, about 20,000 children were examined in this way, the dentists all giving their time.

We knew that one contact a year with teachers was not sufficient to keep up their interest in the work. We knew they were very busy and had little time to devise plans for keeping it going forward. We therefore have devoted a good deal of time to literature for the teacher's use. This literature has been based on the same principles of teaching that all other successful school literature is based upon. It takes into consideration ages, grades and the interests of each group. We have found that the summer lectures with the literature have made working contacts that would have been otherwise impossible.

Mark Twain said that people were always talking about the weather, but nothing was ever done about it. We grew to feel very much the same way in the matter of tooth brushing. We talked to children about it, but felt that they did little. So we decided to do something, and worked out a toothbrush chart. This takes care of after-breakfast and after-supper brushing for the seven days. A child gets a star for each brushing. If no star is absent at the end of the week, a shield is the reward. If there are four shields for the month, a flag is placed in the last space. Any teacher will understand the efficacy of this method. In the instructions sent out with the toothbrush charts, attention is called to the Saturday and Sunday brushing. If a teacher feels that she is unable to keep up with it, she bases her work upon a five day a week plan and explains it to her children. The results of the use of this chart have been gratifying.

A book for mothers and teachers was compiled. This book was intended for busy work for preschool, and first and second-grade children. They cut the pictures and paste them on charts, and the teacher or the mother tells the story. A primer designed for the child's individual use was called the "Five Little Pigs." We asked the teachers to use it in class. It is printed in primer-sized type and has only the words used in the primer and first-grade books. Children like it because of its color.

There is a play for first and second-grade children—"Some Strange Little Visitors." The costumes for this play were rather elaborate, so the division had a set of costumes made to lend to the teachers. Where it has been given, this play has been liked.

We compiled "Songs, Stories and Rhymes" in tablet form and sent them out to grade teachers. A reader for third and fourth-grade children has

been written and illustrated, but has not been published because of lack of funds. For sixth and seventh grades, "An Old Story" was written, and published in pamphlet form. It was based upon the story of King Arthur and his knights. It appeals especially to children of these ages.

During this school session, the state chairman of the child hygiene committee of the parent-teacher association has made mouth hygiene the work of the committee during the year. She is asking the child hygiene committee in each local organization to have one program on this subject, and, in addition, to get a dentist to examine the teeth of the children, the division of mouth hygiene supplying all necessary material. This will begin the work in many places where otherwise it would not be done.

With all of these activities, we realize that the work should be made more intensive. So we plan to interest superintendents and boards of education in employing a dental hygienist for their schools. This year, we have our first hygienist, who is employed in the McComb city schools. Her salary is paid by the school board, the local parent-teacher association and the state board of health. She has four grammar schools under her care and is doing well with her work. All fifth-grade children have been examined and a record has been made for each. The hygienist is doing prophylactic work through the fourth grade in all four schools. If we can continue the work for five years, we shall be able to make logical comparisons. The hygienist lectures to the children and carries on as much other educational work as is possible. We hope that next year more schools will employ hygienists.

The school nurse does constructive work along the lines of mouth hygiene. In some places, she devotes much of her time to educational and corrective work. The home demonstration department has added an incentive with its national health contests. The plan is that each local home demonstration club send one or more girls to the county health contests. Each county winner goes to the state contest. The tri-states, Mississippi, Tennessee and Arkansas, send their winners to the tri-state fair in Memphis. From these three, a winner is chosen to go to the national contest in Chicago. All of this leads us to say that the national prize winner last year was a Mississippi girl, and that the tri-state winner this year is a Mississippi girl. Conditions of the mouth are scored carefully in these examinations. This brings the importance of the proper care of the mouth to many girls in a vivid and practical way.

I do not intend to discuss results in this paper, but would say in passing that the results have been reasonably satisfactory. We are encouraged to believe that the idea of better care of the mouth is taking tangible form in the minds of many of our people who think.

Discussion

C. W. Morris, Dallas, Texas: I am in school work here in Dallas. Would it be possible for me to get any of the literature mentioned by Miss Hudson, and what would it cost?

Miss Hudson: We have made no provision for selling the literature. I was happy to hear that the matter of literature is to be considered by the Association. I have been before a group of children and teachers with nothing to teach them with, and I just had to get this together. We may not have any more of it published if it is available in Chicago, but if it is not, we will keep working on it. I would be glad to send samples but there are none for sale. The demand for the toothbrush story has been unprecedented. We are going to have another supply made soon. The supply of the little pig story is nearly all gone, but I will be glad to send you a sample.

Harris R. C. Wilson, Cleveland, Ohio: You notice I haven't said anything in regard to some of the other papers that have been read here, but I can hardly sit still after hearing this paper. We have heard a great deal about dental clinics, but to me this is mouth hygiene, and it is given to us in a way that is going to get results. When people who are trained for years in dentistry undertake to talk to children, using an extensive vocabulary, they

fail to get the idea over. We must have the work done by people who know how to get down to the level of the child's mind. We cannot expect to talk in Latin to a 6 year old child and have him understand, but I know Miss Hudson is a teacher and she is able to get the idea over. That is the reason I believe that some very radical changes must be made in our attitude toward the mouth hygiene work. We must have people who know how to teach. If we expect our dental hygienists to go in after a year of technical training, to teach little children when they do not know how to teach, we are going to find that it is a failure. They must be taught to teach first. We give our public school teachers two years' training; we teach them how to teach. Now, if we expect our hygienists to teach, we must give them some of the fundamentals of that teaching so that they will present the ideas on the level of the child's mind. That is the point I wish to make.

W. T. McFall, Hartsville, South Carolina: I have a school district and I am carrying on many things that Miss Hudson has just mentioned. I have a toothbrush chart, and when I put it in my district, the first two months, the children were borrowing, buying and stealing toothbrushes from the whole neighborhood in order to get the little gold stars that we gave them each morning. This chart gives a gold star to the child who brushes his teeth twice daily. We can conduct a dental hygiene school for teachers twice a month, and they in turn give fifteen minutes a day to their classes. I have first and second grade teachers, third and fourth, and fifth and sixth, and working last year with Dr. Early along the Virginia plan, as we do in South Carolina, I am carrying on also the work of the state board of health and putting in several pet ideas of my own. A general corrective program is being conducted daily; we are trying to disabuse the child's mind of the horrors of the Dental Chair and teach him to appreciate preventive dentistry.

E. G. Rush, Kansas City, Mo.: It is gratifying to know that the people in Mississippi as well as in other states in the south are doing such wonderful work along hygienic lines. Oral hygiene should be taught in every school in the land. This would save time, money and tooth structure, and dental work would be more satisfactory in consequence. I know children in the schools of Kansas City have been greatly helped by lectures and pictures shown by Dr. McCrum. We have a large number of nurses and hygienists who are obtaining good results in the schools of our city. There are many negligent parents who pay little attention to their own teeth and their children's teeth until trouble develops. We will never get anywhere until we educate through the schools and the press.

BITING FACTS: A RADIO TALK ABOUT TEETH

By EVELYN C. SCHMIDT, Chicago, Illinois

THE value of a man has been estimated at ninety-eight cents. His body contains fat enough for seven bars of soap; iron enough for a medium sized nail; sugar enough to fill a shaker; lime enough to whitewash a chicken coop and sulphur enough to rid a dog of fleas. A first-class human machine valued at ninety-eight cents! Not much, you say. But even at that, how many of us are worth the full price?

The only way that fact can be determined is by a thorough physical examination—a check-up on the human machine. This time of the year seems to be ideal for overhauling and checking up machines, so why not make it a point to consult a reputable physician some day? He will examine your heart, lungs, blood, urine, every part of your body, and tell you where you stand; what your chances are of living longer and better than the fifty-six years which statisticians tell us is the average span of life. From your physician's office, walk directly to the office of your dentist. He will examine your teeth and mouth, checking up with roentgen rays, to discover whether you have abscesses that are undermining your health. This dental check-up should be made two or three times a year, if you want to be

worth as nearly ninety-eight cents as possible.

Nature gives most of us a mouthful of thirty-two teeth, which constitute one of our greatest assets or greatest liabilities, according to their condition. If they are well cared for, they add to our health, besides being a business and social asset by adding to personal charm. If they are neglected, they are a physical menace as well as a mark of ill-breeding. Savage tribes, recognizing the important part which teeth play in their appearance, often submit to great suffering to mutilate their teeth with the idea of beautifying themselves. In French Indo-China, for instance, the teeth are dyed black; while certain African tribes file their teeth into a triangular shape.

More important than looks is the fact that the teeth are the chewing machine that prepares the food for the stomach. A sound set of teeth masticates the food well, so that it can nourish the body; while an unhealthy mouth and a broken down set mean poor mastication, indigestion, malnutrition and lowered vitality. Many systemic diseases may be traced directly to an unhealthy mouth.

What, then, are the various steps in keeping the mouth healthy? The first begins with the mother; for a baby's first teeth are almost completely formed by the mother while she is carrying her child. Consequently, during this period, every mother should eat the foods that are the source of tooth-building elements—calcium, phosphorus and the vitamins. These foods are milk and the dairy products; vegetables, especially green, leafy ones; fresh fruits, especially the citrous fruits; whole grain breads and coarse, cooked cereals.

Next, a child should be breast fed. A child develops more during the first six months of life than during any other corresponding period. Therefore, it is extremely important that the child have the best food in the world for it—mother's milk. Moreover, natural suckling stimulates the proper growth and development of the jaws and face; whereas artificial feeding tends to restrict this growth.

When a child is weaned, he should be given healthful, growth-promoting foods—a quart of milk a day, one vegetable besides potato, fruit, cooked cereal, for instance. A child should not be given sweets, especially between meals, for they dull his appetite for the proper foods as well as cause tooth decay. No one was ever born with a "sweet tooth," though Americans seem to have cultivated one. Last year, we consumed over 103 pounds of sugar per person—more than any other country in the world. When sweets are eaten, they should be taken in the form of a simple dessert at the end of the noonday meal.

Teach your child how to chew. Every part of the body must be exercised to keep it normal and healthy, and the mouth is no exception. The Eskimo has teeth almost free from tooth decay and has broad, well-developed arches, due to his diet, in which the food has not been demineralized and degerminated, and to the fact that he chews. In fact, one of the duties of an Eskimo wife is to chew her husband's shoes to soften them so that he can put them on. We do not need to chew shoes, but we do need to eat sufficient hard, fibrous foods to give the teeth and gums proper exercise.

Remember the first teeth are important—as important as the second. They are needed for chewing, to keep the face in shape and to guide the second teeth into place. Begin caring for your child's teeth as soon as the first one appears, by cleaning it with a piece of cotton dipped in boric acid or salt and water. When your child is about 2 years old, begin to teach him to clean his own teeth. At about 6 years of age, look for the first perma-

nent molars. They are the first permanent teeth, the keystones of the dental arch, erupting back of the baby teeth. If your child is 5 or 6 years old, count back five teeth from the center of the mouth. If the sixth tooth has appeared, it is the first permanent molar. Now is the time to take your child to the dentist again, for of course you have been taking him at least twice a year since he was about 3 years old.

These biting facts will help save the teeth of children, and, since adults are just grown-up children, the same suggestions about a proper and adequate diet, few sweets, proper chewing, frequent visits to the dentist, and good daily care of the mouth, apply to them.

Statistics make us realize that we must regard the problem of dental decay as a serious one. At the Mayo clinic, an examination of 1,500 patients showed that 87 per cent had infected teeth and 80 per cent were suffering from pyorrhea. Country-wide examinations of school children show that about 95 per cent of boys and girls have decayed teeth, the average number of cavities being six. Such conditions make the individual worth less than the ninety-eight cents about which we spoke. In fact, teeth are so closely related to general health, success, and happiness that it is a good idea to check up to see that your mouthful is one of wisdom.

CHILD HEALTH LIBRARY

The Child Health Library is a series of ten pocket sized books by practicing specialists of the highest standing, giving the latest and most authoritative information on every phase of child health; edited by John C. Gebhart, with an introduction by Haven Emerson, M.D., formerly health commissioner of New York City; and professor of public health administration, College of Physicians and Surgeons, Columbia University.

Titles of volumes are:

I. Pre-natal Care and the Baby's Birth; by Harbeck Halstead, M.D., Attending Obstetrician and Gynecologist, Sloane Hospital for Women, New York; Instructor in Obstetrics and Gynecology, Medical Department Columbia University.

II. Babies—Their Feeding and Care; by Louis C. Schroeder, M.D., Asst. Professor Diseases of Children, Medical College, Cornell University; Chief of Clinic, Out-Patient Dept., New York Nursery and Child's Hospital.

III. The Neglected Age—The Child From Two to Six; by Bernard S. Denzer, M.D., Adjunct Attending Physician in Diseases of Children, Mt. Sinai Hospital, New York City; formerly Instructor in Children's Diseases, Medical College, Cornell University.

IV. Dangers of the School Age; by M. Alice Asserson M.D., Director of Children's Service, New York Tuberculosis Association; Assistant Physician, Teachers' College, Columbia University.

V. Communicable Diseases of Childhood; by Stafford McLean, M.D., Instructor in Diseases of Children, College of Physicians, Columbia University; Attending Physician, Babies' Hospital, New York City.

VI. Hygiene of the Mouth and Teeth: by Thaddeus P. Hyatt, D.D.S., Director of Dental Department, Metropolitan Life Insurance Company.

VII. What Children of Various Ages Should Eat; by Lucy H. Gillett, M.A., Director of Nutrition Bureau, New York A. I. C. P.; Author of "Dietetics for High Schools," etc.

VIII. How Children Ought to Grow; by John C. Gebhart, Director of Social Welfare, New York A. I. C. P.; Author of "Growth and Development of Italian Children," etc.

IX. Psychology of the Child; by David Mitchell, Ph.D., President New York State Association of Consulting Psychologists; Visiting Psychologist Kings Park State Hospital, Kings Park, New York.

X. Educational Problems; by David Mitchell, Ph.D.

Robert K. Haas, Inc., 218 West Fortieth Street, New York City, is the publisher and the price is $3.00.

"THE BAD BABY MOLAR"

The Texas State Board of Health has distributed copies of the one-act play "The Bad Baby Molar" to all of the school teachers and public school nurses in the state.

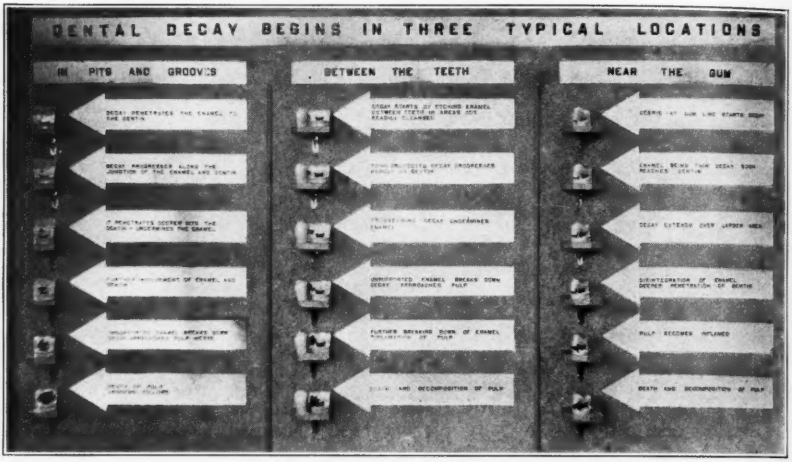

Exhibit of Dallas County Dental Society: "Dental Caries and Subsequent Infective Destruction."

EXHIBIT OF DALLAS COUNTY DENTAL SOCIETY

The exhibit of the Dallas County Dental Society in the Health Section at the 1924 session of the American Dental Association dealt with dental caries and subsequent infective destruction.

This exhibit was divided into three sections, the first taking up the progress of dental caries starting in three typical locations and proceeding to an advanced stage. This progress was shown by plaster models and accompanying descriptions in black letters on translucent arrow-shaped backgrounds. These arrows were illuminated in sequence in an effort to bring to the observer the successive steps in the progress of the dental caries.

In the second section, the steps in the formation of an apical abscess were shown. For this, successively illuminated descriptions were used calling attention to a series of seven sections of a part of a lower jaw.

The third section dealt with evidence of destruction caused by infection in which dental caries had been a factor. The first evidence was in the form of granuloma adhering to the roots of extracted teeth. Next, a number of skulls were exhibited, showing very definite evidence of destruction following caries-produced abscesses. Then roentgenograms showing radiolucent areas about broken down teeth were shown, some of these being of the above mentioned skulls. The exhibit, which was arranged for the county dental society by the College of Dentistry, of Baylor University, was in charge of Howard L. Miller, D.D.S., superintendent of the College of Dentistry, Baylor University, Dallas, Texas.

MORE BETTER TEETH STORIES

The first group of stories was so heartily received that a second group has been compiled. The price of "Better Teeth—Better Health Stories" is 35 cents. The stories are:

The Sad Story of Mary Suck-Her-Thumb, by J. Mace Andress.

A Visit to Lollipop Town, by J. Mace Andress.

Tails and Pearls, by Charlotte Greenhood.

John Speckled-Tooth's Loss, J. Mace Andress.

Good Questions About the Teeth, answered by J. Mace Andress.

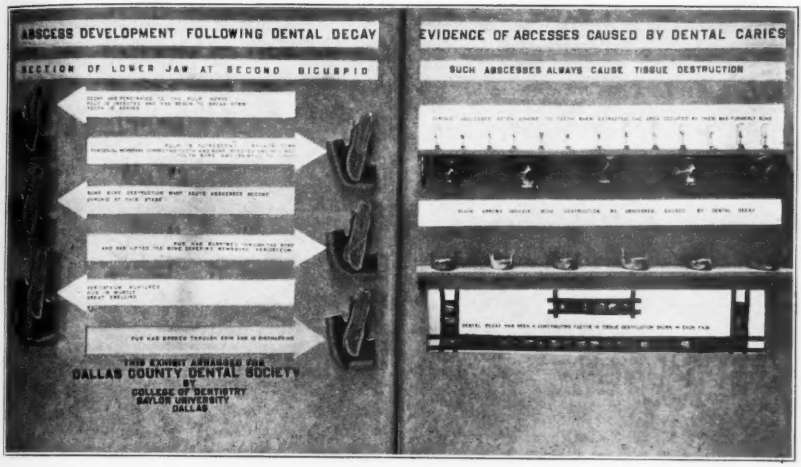
ABSCESS DEVELOPMENT FOLLOWING DENTAL DECAY
SECTION OF LOWER JAW AT SECOND BICUSPID
THIS EXHIBIT ARRANGED FOR
DALLAS COUNTY DENTAL SOCIETY
BY
COLLEGE OF DENTISTRY
BAYLOR UNIVERSITY
DALLAS
EVIDENCE OF ABCESSES CAUSED BY DENTAL CARIES
SUCH ABSCESSES ALWAYS CAUSE TISSUE DESTRUCTION

Exhibit of Dallas County Dental Society

RECENT HEALTH PUBLICATIONS

One of the most important publications that has yet been issued on the subject of health education is the report of the Joint Committee on Health Problems in Education of the National Education Association and the American Medical Association. No health worker whose activities in any way touch the schools can afford to be unfamiliar with the contents of this report.

To quote from the foreword by Dr. Thomas D. Wood, chairman of the Joint Committee: "During the last ten years there has occurred a great wave of intense interest in and intensive development of health work in the schools which has been accompanied by unprecedented stimulation of interest in health by organizations outside of the schools, and the contribution to the schools from many outside sources of a fascinating and confusing mass of materials, ideas and devices for health teaching. This has made it desirable and necessary that the educational forces within the schools should study, interpret and coordinate the aims, materials and methods in the field of health education so that the schools of the country may be provided with an educationally sound program of health teaching. To do this completely would require years of thorough investigation and experimentation of a kind which it has not yet been possible to carry on. However, until such investigation may be undertaken, it is hoped that this report may provide the best available guidance to the schools of the country relative to health teaching in the immediate future."

This report, called "Health Education: a Program for Public Schools and Teacher Training Institutions" devotes one chapter to mouth hygiene. It can be obtained from Dr. Thomas D. Wood, Columbia University, 525 West 120th St., New York City.

"Health," by Turner and Collins, will be found particularly useful in those schools where the responsibility for the health program is divided among individual pupils according to their age and accomplishments. The subject matter is presented in simple and clear fashion. The conception of the body as a "living ship," an idea which is carried throughout the entire book, is a particularly happy one. The material and suggested procedures have all been found successful in actual practice in the Malden schools. The book is certain to arouse a live interest in health on the part of the children who are privileged to use it. The teacher, too, will find "Health" a very real help in developing her health education program.

"Health," by C. E. Turner, Associate Professor of Biology and Public Health, Massachusetts Institute of Technology; Associate Professor of Hygiene, Tufts College Medical and Dental School; Director of Health Education Studies at Malden, Mass.; and Georgie B. Collins, Special Health Teacher, Malden, Mass. Chicago: D. C. Heath and Company, 1924. Pp. 209. Illustrated. Price 80 cents.

"The Happy Baby." Editorial Advisor, Dr. L. Emmett Holt. Contributors Dr. L. Emmett Holt, Dr. Harvey J. Burkhart, Dr. Ralph Lobenstine, Dr. Henry L. K. Shaw. New York, Dodd, Mead & Co., 1924, 120 pp. Under this title are brought together the articles which appeared in The Happy Child Department of the Delineator while that department was under the editorial direction of Dr. Holt. The book is dedicated to "the health of the American child and to the memory of America's great child doctor, the late L. Emmett Holt."

KEEPING EMPLOYEES IN GOOD HEALTH

Applicants with such defects as those of vision, heart disease, hernia, varicose veins, flat feet and high blood pressure are employed in many industries with the understanding that their physical status will be checked up by a careful examination at stated intervals and that they will follow the advice of the industrial physician in securing proper treatment for their condition. Many industries furnish new applicants with examinations by oculists and with proper glasses at cost. A few give employees dental care at the plant without charge or at a minimum fee. Many others lend the employee money to have necessary dental work done. The periodic physical examination of employees is a "stock taking" of one of the great assets of the industry. The old and trained employee is a valuable machine and an expensive one to replace. It has been estimated that even the replacing of a messenger boy or an unskilled worker by a new one costs the industry several hundred dollars in time lost, in mistakes made and in neglect by fellow employees in their work in order to instruct the new man in the various rules or methods of the plant.—John D. Ellis, in Hygeia, January, 1925.

"SEE YOUR MOUTH AS OTHERS SEE IT"

A cardboard man, one sign and a mirror are all that are necessary for the exhibit "See your Mouth as Others See It." The cardboard man is painted both back and front. He stands on a table, with his back to the spectators, but his smiling face, showing beautiful teeth, is reflected in the mirror. Might not this meager equipment and the seven words bring home the mouth hygiene message forcibly?

An effective exhibit that can easily be presented.

EXHIBIT AT INDIANAPOLIS

At the annual meeting of the Indianapolis Dental Society held in January, the Committee on Oral Hygiene presented an exhibit of dental health educational material.

The Journal of the American Dental Association

5 North Wabash Avenue, Chicago, Illinois.

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Editorial

LET US MAINTAIN THIS RECORD

The reputation of a profession is largely influenced by the personal behavior of its members, and it is always gratifying to feel that the world at large has a good opinion of one's calling. In the Sunday, December 28, 1924, issue of the Dallas *Morning News*, there is an article on hotel management by Walter C. Hornaday, in which he discusses the experiences of hotel men with different classes of the traveling public. One paragraph of this article is as follows: "The delegates attending the convention of the American Dental Association in Dallas in November were the best behaved and the highest class of men that has ever been cared for by the Adolphus Hotel during a large assembly, according to R. B. Ellifritz, managing director of the hotel. Mr. Ellifritz praised the personnel of the dentists to the skies."

An unsolicited and unexpected testimonial of that kind coming so spontaneously from a hotel man more than a month after the meeting must be looked upon not only with appreciation but also with a high degree of significance. "By their deeds ye shall know them" is trite but true, and Mr. Ellifritz has paid the dental profession a very rare compliment in this offhand statement. There are two reactions that dentists might well have from this occurrence—a feeling of gratitude to the manager of the Adolphus for going out of his way to pay them so fine a tribute, and a sense of the responsibility and obligation imposed on them by the confidence thus implied in their gentlemanly bearing. A reputation of this kind is no mean asset in securing a recognized status in the estimate of the world, and it is well worth the consideration of every member of the Association to see not only that this reputation is maintained, but also that it is enhanced in every way possible. Dentists in attendance at our annual conventions should deport themselves in such a manner that the eyes of the world can find no fault with their behavior and that they leave an impression wherever they go that they belong to a cultured and well-mannered calling. Even if

there should be among us those who take little pride in their reputation as persons, they should at least preserve the amenities most scrupulously in their capacity as professional men. The professions are being evaluated more and more carefully in the esteem of thinking people, and there is an ever-increasing tendency to discriminate between the worthy and the unworthy; so that dentists have a very real and urgent incentive to justify on every occasion the reputation which Mr. Ellifritz has been good enough to give us at Dallas.

In another relation, the American Dental Association has achieved a distinction that is gratifying to its members. The passenger traffic associations have notified us that, on account of the great numbers attending our annual session, we must guard against a conflict of dates with other large organizations in the United States, owing to the fact that it would be impossible for them to supply Pullman capacity properly to transport our members. We have been accorded the reputation of a larger attendance at our meetings than any other national body except one, and this introduces a problem for the traffic managers which has to be approached with some care on their part, if we are to be adequately accommodated.

Thus it will be seen that our great development in recent times is drawing to us a widespread recognition of our national character and making of us an integral part of the more or less complicated machinery of our modern civilization. It is hardly to be expected that the rank and file of our membership at the present time fully realize the significance of representation in this great body, but more and more it must be borne in on them by such observations as those of the Dallas hotel manager and the heads of the passenger traffic associations what it is to belong to the American Dental Association. And may we not hope that, in this rapid evolution that permeates all of our activities, we shall be able to say in the erstwhile more or less platitudinous statement of the meteoric Coue, "Every day in every way we are growing better and better?" This is a "consummation devoutly to be wished," and the members have it in their power to make it materialize.

C. N. JOHNSON.

MOUNTEBANK SCIENTISTS

A noted publicist states that no 100 per cent American can be an intelligent American, the idea being that intelligence must observe the weakness and errors in the nation's activities, faults which intelligence refuses to underwrite. That same intelligence realizes what the nation's virtues and values are, subscribes to them, supports them, and defends

them. He concludes that a 50 per cent Americanism, thus selective, is a superior and the only safe Americanism.

It is evident that this spirit of approach must characterize any criticism one may make of one's adopted profession. Certainly, no intelligence can adopt and laud any profession without reservation and no intelligence criticizes with exultation in criticism. The critical patriot observes weaknesses and derelictions to correct them. Thus, in what follows, we plead our interest in dentistry.

It is obvious that dentistry should proscribe the mountebank scientist who capitalizes on the publicity obtained from the dental platform. We refer rather directly to the man who, with no recommendation but his own word and something to sell, gets access to our programs and platforms. Why is it so easy for such a man to reach our halls and what must be his opinion of us for admitting him? Or, still more to the point, what is the esteem for us held by other scientific organizations, and what is our regard for ourselves?

Such a man rides the wave of some new enthusiasm such as marks the diet question today. He has a food to sell or sees popularity and plaudits for one who can invest himself with a laboratory toga and mix laboratory terms with success. Evidently, he has no background for his science; his observations are inaccurate; his conclusions superficial. As a result, he is given to statements that are attractive to the unspecialized, but untrue. His claims run the gamut of extremism, and their repetition by the credulous and unwary bring reproach on the profession.

Of a piece with this and an effect of the same cause is the salesman telling, with abysmal ignorance of tissue or drug processes or technical procedures, what his commodities will accomplish; or a mechanic advising the world that his appliance will make a specialist in the most delicate of operations out of any practitioner, or that he, the mechanic, will "make a plate fit perfectly" where the dentist has failed. That such a man dares not put his hands into any mouth but his own for operative purposes is scouted. A few years ago, such a man, a skilled mechanic became a "doctor" in the parlance of doctors to whom he gave instructions in mechanotherapy at a glittering price. On the wave of interest in pyorrhea, untutored tongues discussed tissues and their reactions, chemistry and its importance, drugs and their potencies, mechanics and their dependability, as well as bacteriologies and pathologies and anatomies as weird as medieval wizardy.

Not long since, a man who frequents the public rostrum announced his intention to assert that cancer was due to the use of nonself-limiting drugs. A reason for the statement was farthest from his mind, his as-

sertion was *a priori, ex cathedra* if you please. What lured this simple intelligence is hard to postulate, but a bystander possessed of a sense of humor, observing the naivete of the speaker, risked a question. "How can you have a cancer without epithelium?" he asked. "Epithelium", said the loquacious one, "must there be epithelium to form a cancer?"

Of a similar sort is the assertion from our national platform that food properly selected would make the eater impervious to subzero temperatures though he were unclothed. An ancient diet story associated three select and temperate eaters with a furnace heated to high-fusing potentiality. The narrative states that neither were they injured nor was there the smell of fire upon them. A splendid argument missed by the charlatan dietitian!

Obviously, the individual dentist is left much to his own judgment and desires when his office is invaded, but the professional forums must be safeguarded and their dignity and standards maintained. No man should be admitted to a program or a journal as a teacher on any special issue who is not accredited, and whose credentials have not been examined.

This would not exclude the man whose interest has carried him to real scholarship although not university trained and approved. Such a man will be recognized and his rating established by accepted methods. He will not desire publicity nor accept it prematurely if his instincts are sound.

A self-made man is usually a poorly made man; a well-made man though self-made needs no defense. Men do not easily jump into authority in science or art, and it is folly to expect an overnight study to make a student into a philosopher.

Similarly, it is easily possible for a university product to be ordinary or subordinary, but, like the other products, it must find its level. It is trite to say that university experience does not guarantee a man; but no sensible mind discredits it as a guide. The means available should make it easy to get a man's scholarship record, the classification of his research and his eligibility to the desk of the teacher. With this at our service, why endure the embarrassment of mountebank scientists?

MEMBERSHIP DUES DUE JANUARY 1, 1925

The dues for 1925 are $4.00, which includes the annual subscription to THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, and they are due January 1. The March JOURNAL will not be mailed to any delinquent members. Therefore, any dentist who has not already paid his state society dues for 1925 should do so immediately. The state society

officers are cooperating with the American Dental Association and will immediately, on receipt of the state dues, mail the American Dental Association dues to the national office.

It will be impossible for us to furnish back copies as we are printing only enough to supply our bona fide mailing list. The Constitutional and Administrative By-Laws provide:

Article XI, Sec. 3.—All members of the American Dental Association in good standing shall receive THE JOURNAL free.

The Constitution and By-Laws also specifically states in Chapter I, Sec. 3:

Sixty (60) days after January 1, the General Secretary shall drop from membership roll the names of all whose dues for the current year shall not have been received.

An immediate compliance with this notice will save the delinquent member a great deal of confusion and misunderstanding. A delinquent member is one who does not have his 1925 membership card on January 2, 1925.

In view of the foregoing requirements of the Constitutional and Administrative By-Laws of the American Dental Association, the February issue of THE JOURNAL is the last number that will be mailed to those who have not paid their 1925 dues.

In Indiana a doctor writes that he has missed The Journal for a few months and cannot do without it, but admits that he has not paid his medical society dues until recently and gives as his excuse that he wasn't notified. We always have thought that medical society dues are like taxes, due and payable at a certain time and delinquent after that time. Every doctor should know that his medical society dues are supposed to be paid on or before January 1 of each year, and become delinquent on February 1, after which he fails to receive the benefits of membership. As a matter of courtesy all county medical societies officially notify members concerning the payment of dues, but even if they did not do so, if the members of the Association read The Journal they will be reminded of their obligation. Right now is a good time to hand the medical society dues to your secretary.—*J. Indiana State M. A.*, December, 1924.

Before the first of the year many county medical societies will have an election of officers. It is well for the members to take into consideration the fact that a secretary can either make or break an organization, and accordingly considerable discretion should be used in the selection of a man to fill that office. A good secretary, if he is a young man, usually is energetic, progressive and tactful. Such a man almost has to be forced to accept the position but the results are worth the high-handed methods adopted to secure him. On the other hand, the secretary must have the cooperation and help of the individual members of a society. He should not be obliged to dun and redun members for dues, nor to beg and implore men to help make up a scientific program. A good secretary will induce regular attendance, and he will make sure that when the society meets there will be a program worth while.—*J. Indiana State M. A.*, December, 1924.

Medical and Dental News

CALIFORNIA

Pneumonic Plague: As a result of preventive measures instituted, November 2, the condition seems to be under control, but plague infected rats have been found in various parts of Los Angeles. Eradication of the rodents has been begun, the California State Board of Health cooperating with the local health authorities. The United States Public Health Service has stationed a commissioned officer at Los Angeles to attend to fumigation of vessels. Several foreign countries have quarantined against vessels coming from Los Angeles. Three plague fighters from the Public Health Service are to remain in the city as long as necessary.

COLORADO

Hospital Opens Dental Clinic: The Denver General Hospital, Denver, in affiliation with the University of Denver Dental College, has opened a dental clinic. Every patient entering the hospital will receive a dental examination and treatment, if necessary. G. D. Lacey, D.D.S., of the Dental College, is in charge of the clinic.—J.A.M.A., Dec. 6, 1924.

INDIANA

Society Dues: At the recent meeting of state medical association secretaries held in Chicago, it developed that some states have medical society dues of as much as twenty-five dollars per year, and there are a number of states that have dues of fifteen dollars per year. The general opinion from these states was that doctors do not object to dues if they really are getting something for the money expended, and in the states where the dues are twenty-five dollars per year many of the doctors have said, "Raise the dues to fifty dollars per year if you can do any more than you are doing now." When all is said on this subject isn't it ridiculous for doctors to offer complaint concerning the insignificant sum asked for medical society dues for an entire year when the average doctor will spend more than that amount in one night for entertainment at the theatre, and does not bat an eye to pay ten times as much as a penalty for frivolity of one kind or another. It is a strange world when we find fault with the things really worth while and wink at or really approve things that are relatively worthless. We ought to change our rules of conduct.—J. Indiana State M.A., December, 1924.

Logansport School Clinic: Following is the report of the first year's work at the Logansport school clinic: number of children given care, 254; number of permanent teeth restored, 287; number of temporary teeth restored, 85; number of teeth treated, 38; number of extractions of temporary teeth, 137; number of permanent teeth extracted, 18; number of children having prophylactic treatment, 35. One half day each week is devoted to the work, which is donated by the Logansport Dental Society.

Indianapolis Dental Clinics: The first of a number of new dental clinics for children to be maintained by the city of Indianapolis was opened November 24, it was announced by Paul L. Kirby, director of the division of child hygiene of the board of health. Four clinic stations have been conducted and eight clinics a week held.

NEW YORK

Mouth Hygiene in New York City: In an effort to cooperate with the Oral Hygiene Committee of Greater New York, the Board of Education has issued circulars addressed to the district superintendents and principals asking that they encourage their pupils to visit the dentist as early as possible in order to have cleaning and reparative work done. It is hoped to establish the habit of an

annual visit to the dentist. Circulars addressed to dentists advise of this action by the board, and ask that the dentist cooperate in giving proper care, and instruction in the use of the toothbrush.

Eastman Benefactions: George Eastman of Rochester, N. Y., has to date benefactions amounting to $58,602,900 to his credit, the University of Rochester being the largest single recipient. His latest gift of $15,000,000 is shared by four colleges: Massachusetts Institute of Technology, University of Rochester, Hampton Institute and Tuskegee Institute. Rochester Dental Dispensary was founded at a cost of $2,500,000.

PENNSYLVANIA

A Mountain Clinic: The Bulletin of the Odontological Society of Western Pennsylvania gives an interesting account of a trip taken by two members of the school of dentistry faculty of the University of Pittsburgh, Drs. D. R. McMonigle and D. L. Black, into the Kentucky mountains, to hold a ten days' clinic. These mountaineers are virtually cut off from the world, and they eagerly seized the opportunity offered to receive treatment. The trip was made by rail until the last twelve miles, which was covered on horses and pack mules. The operators' work consisted of fillings, root treatments and extractions. The painless methods were a source of wonder to the patients. During nine working days, 592 operations were performed, on 178 patients. Some came 15 miles, the journey requiring three or four days. Most of the patients presented mouths that were in better condition than might be expected, the settlement nurse's efforts in introducing toothbrush drills and in giving talks on mouth hygiene probably being largely responsible.

SOUTH CAROLINA

Dental Clinics in South Carolina: Since last October, the dental department of the South Carolina State Board of Health and the Darlington County Health Department have operated a dental clinic in the schools of Darlington County. The object of these clinics is to give every school child an opportunity to have the teeth put in good condition at a very nominal fee, or, in case of those unable to pay, without cost.

SOUTHERN CALIFORNIA

Southern California Dental Association Officers: The Southern California Dental Association has elected the following officers: president, Bert Boyd; secretary, J. Walter Gray; treasurer, C. C. Noble, all of Los Angeles.

FOREIGN

Dental Practice in Czecho-Slovakia: In Czecho-Slovakia, the Minister of Public Health passed, in 1920, a law restricting the practice of dentistry to graduated physicians who have pursued, in addition to the curriculum leading to the medical qualification, a special course of dental instruction of two years' duration. Thus the qualified dentist in Czecho-Slovakia now must be a physician who has had, in addition to his medical course, two years of dental training. Before the present law, only physicians were permitted to practice dentistry, and such dental training as they acquired was voluntary, and not obligatory. Dental mechanics were not permitted to operate upon patients or administer therapeutic treatment. This state of affairs was general throughout the Austro-Hungarian Empire. The practice of dentistry was relegated by law to physicians who had not necessarily studied the subject as a part of their medical course, and therefore knew but little about it, and practice was prohibited to dental mechanics who, at least, presumably, knew something about it. Dental practice was consequently in a parlous state so far as the native practitioner was concerned. Under the new political regime an effort was made to correct the faults of the situation and decisive steps were promptly taken to secure to the people of the new nation an adequate and efficient dental service as a factor of the public health, and the above-mentioned law was passed.—Dental Surgeon, November 15, 1924.

Mammoth's Teeth: At a dental meeting recently held in London, Sir John Bland Sutton, the eminent surgeon, related how he had spent a night in a tunnel which was being bored under the Thames and had discovered there the teeth of mammoths, which once disported themselves in the country which is, today, London. This led him to remark that although in the dead body the teeth were the most indestructible part, in the living body they, as well as the hardest bones of the skeleton, could be easily destroyed by micro-organisms. In spite of the great advances of knowledge, he continued, biologists were still unable to explain the method by which vegetable and animal life appeared on this planet. He had to confess, in all humility, that the wis-

est of them did not understand the forces underlying not only the growth of bone, but even such apparently simple things as the development, eruption and shedding of teeth.—Dental Surgeon, Dec. 13, 1924.

Health of School Children: Systematic dental inspection reveals the fact that more than two-thirds of the whole school are suffering from dental disease. Dental inspection and treatment are being carried out to a limited extent by 246 education authorities in England and Wales. During the past year, the total number of children dentally inspected was 1,587,249, of whom 1,077,774 (67.9 per cent) were found to be in need of treatment. The actual number treated was 618,491, or approximately one-tenth of the school population of the country. The number of local education authorities that exercised their powers under the Provisions of the Meals Acts was 138 (out of 317), as compared with ninety-eight in the last year before the war. They provided eleven million free meals in the year, substantially fewer than in 1922-1923, or even than in 1913-1914.—London Letter, J.A.M.A., Dec. 6, 1924.

Minister of Health Sues Cancer Institute: Justin Godart, minister of labor and health, France, has instituted legal proceedings against a medical institute of Paris which professes to cure cancer with surgery, it is reported. The object of the suit, if court action fails, is to obtain new legislation for the protection of cancer victims. After observing surgical and roentgen-ray demonstrations at the recent international congress at Strasbourg, Minister Godart was convinced, it is reported, that he had no right to allow cancer patients in France to be encouraged that a cure was possible by medical treatment alone.—J.A.M.A., Nov. 22, 1924.

Lip Cancer: The well-marked casual relationship between clay pipe smoking and cancer of the lip is indicated in a recent account, by the Secretary of the Norwegian Committee for Cancer Research, of the cancer campaign in Norway. Of all the notified cases of lip cancer in Norway, 97 per cent involved the lower lip, and as great a proportion of 88 per cent of all these patients were males. Nearly all these cases come from distant valleys among the mountains or from forest or coast districts where the clay pipe is still much smoked. From 2,700 to 3,000 deaths from cancer occur every year, there being 16.9 deaths from cancer for every 10,000 living persons in Norway. From 51 to 52 per cent of all the cases of cancer affect the stomach, and 66 per cent are found somewhere in the digestive tract.—Dental Rec., December, 1924.

Birmingham Dental Hospital: Birmingham Dental Hospital, situated in Great Charles Street, has made a strong appeal for £5,000, with the threefold object of enabling the committee to put in hand the internal renovation of the hospital, to bring the equipment up to the standard of the best modern practice, and to put it in a position to meet the pressing need of an extended dental hospital service in Birmingham, as well as making it worthy of the city in which it stands. An encouraging response has already been made to this appeal, the committee having received over £2,000 besides additional annual subscriptions, but the hospital has no investments or reserve funds of any kind, and there is therefore an urgent necessity for much more generous support from the public if the institution is to be placed on a fully efficient and sound financial basis. It is worthy of note that last year the hospital provided treatment for about 6,000 patients as well as 1,360 school children under the care of the Education Committee. There was an excess of expenditure over income of nearly £600 and the accumulated deficit in March last had risen to £1,469.—Dental Surgeon, Dec. 6, 1924.

GENERAL

Gorgas Memorial Program: This program is now in process of development. The American College of Surgeons is backing the movement, which has as its aim the establishment of an institute in Panama for research in tropical diseases and a health educational campaign covering health subjects and, in particular, the necessity for observing certain sanitary regulations in order to avoid the ravages of disease, with destruction of the mosquito and the fly as an aid in eliminating the disseminators of disease. The Republic of Panama has donated a site, and the South American republics have agreed to raise at least one million dollars towards the endowment fund in appreciation of Gorgas' success in eradicating yellow fever from the southern continent. It is hoped that the United States government will contribute at least one million dollars, and, in addition, five million dollars will be raised

by popular subscription in the United States and Canada. The endowment fund will be invested in trust securities and the income only utilized to provide a permanent working fund.—J. Indiana State M.A., December, 1924.

New Journal of Otolaryngology: With the January issue, the American Medical Association begins the publication of a new special journal, making six publications, besides the journal of the association. The Archives of Otolaryngology will be published monthly, with George E. Shambaugh as chairman of the editorial board.

Improved Type of Feeding Bottle: Sylvan Dreyfus of Lausanne has perfected a feeding bottle which demands of the child the same physiologic movements that are employed in breast-feeding. Results of tests at a children's clinic have been very satisfactory, children who were being both breast and bottle fed experiencing no difficulties in alternating between the two. The new bottle requires fifteen or twenty minutes for emptying as against five minutes time as required by the old style of bottle, so there is the advantage of slow feeding, in addition to the increased muscular effort required.

Industrial Dental Clinic: In the dental clinic of the United States Playing Card Company, the hospital and dental departments cooperate in their health plans. The clinic purposes to give all employees prophylactic treatment; to give instruction as to the importance of a clean, healthy mouth, and the best methods of using the toothbrush, and to call attention to conditions that need the care of a dentist. Dr. C. H. Schott is the supervisor of the clinic, which is equipped with modern apparatus throughout. The ages of the employees range from 16 to 70. Prenatal influences on the teeth are emphasized in talks to the younger girls, many of whom are married. Records show that 75 per cent of employees have had dental care for the conditions called to their attention on examination in the clinic. The clinic which was established in October, 1923, has the following record: mouth examinations, 2,849; visits to clinic for treatment, 1,683; average number of decayed teeth per person, 4.5; fillings per person, 7; missing teeth per person, 6.4; perfect teeth (sets) 21.

Causes of Death in 1923: The Department of Commerce announces that 1,193,017 deaths occurred in 1923 within the death registration area of continental United States, representing a death rate of 12.3 per thousand population as compared with a rate of 11.8 in 1922. The death registration area (exclusive of the Territory of Hawaii) in 1923 comprised thirty-eight states, the District of Columbia, and fourteen cities in nonregistration states, with a total estimated population on July 1 of 96,986,371, or 87.6 per cent of the estimated population of the United States. The increase in the rates from influenza, from 31.4 per hundred thousand population in 1922 to 44.7 in 1923, and from pneumonia (all forms) from 102.1 per hundred thousand population in 1922 to 109 in 1923, accounts for nearly half the increase in the rate from all causes. Some of the other causes for which the rates increased are diseases of the heart, measles, cerebral hemorrhage, whooping cough, cancer, automobile accidents, nephritis, railroad accidents and accidental falls. Decreases appear in the death rates from tuberculosis (all forms), diphtheria, malaria and typhoid and paratyphoid fever.—Pub. Health Rep., Dec. 19, 1924.

Offspring: The Department of Commerce, turning for a moment from the compilation of statistics on linseed oil and lumber, gave attention for a brief space to the very human subject of children. But as usual it had to deliver its findings in the form of statistics. It presented its results in maximums and minimums.

Families with fathers 45-49 years old

	All Children	Living Children	
Max.	8.1	6.6	Coal Miners
Min.	3.3	3.0	Physicians, Dentists, Surgeons

Families with fathers 40-44 years old

	All Children	Living Children	
Max.	7.0	5.9	Coal Miners
Min.	2.8	2.6	Architects, Actors

Inferences which may be drawn from these statistics:

That men engaged in coal mining are more prolific than men engaged in other occupations.

That coal miners by average add 1.1 children to their families between the ages of 46 and 49.

That about 3 out of 4 children born to

coal miners before the age of 50 are living at the end of that period.

That physicians, dentists and surgeons have the smallest number of children at the age of 50 when presumably their families are completed.

That of the children born to physicians etc., under 50 years of age, 10 out of 11 live to the end of that period.—Time, Jan. 5, 1925.

A New Institute of Research: Announcement has been made of the establishment of the Lehigh Institute of Research by Lehigh University. The purposes of the institute, as outlined by the board of trustees, are "to encourage scientific research and scholarly achievement in every division of learning represented in the university in recognition of the need for further and more exact knowledge in science and in the application of science to the affairs of modern life." The management of the institute is vested in a board of directors, composed of thirteen members of the staff of the university, including the president. The Lehigh Institute of Research will afford training to the following classes: members of the teaching staff of the university; members of the scientific staff of the institute, including research fellows, assistants and professors appointed by the university, and special investigators temporarily employed.—J.A.M.A., Oct. 11, 1924.

Christian Scientists and Manslaughter: Warrants charging manslaughter were recently issued for the arrest of two Christian scientist practitioners of Winnipeg and for the father of Doreen Watson, aged 12, who died of diphtheria, it is reported. The warrants followed the finding of a coroner's jury, according to reports, that the parent had been guilty of gross negligence and that the practitioners had committed a breach of the medical act of Manitoba. — J.A.M.A., December 20, 1924.

DENTAL CORPS

Army: Major Eugene Milburn from duties at Fort Sam Houston, Tex., to Fort Crook, Neb., for duty.

Captain Dell S. Gray from duties at Fort Sam Houston, Tex., about Nov. 15 to Selfridge Field, Mich., for duty.

Captain William F. Wieck from duties at Fort Sam Houston, Tex., to Fort Des Moines, Iowa, for duty.—Army and Navy Register, Nov. 15, 1924.

Captain Jerome L. Fritche retired on account of disability.

Captain Robert C. Craven from duties at Fort Ethan Allen, Vt., January 1, to New York City and about March 4, via Government transportation, to Hawaii for duty.

Captain Roy A. Stout from duties at Fort Sam Houston, Tex., to station hospital, Fort Sam Houston, for duty.—Army and Navy Register, December 27, 1924.

DEATHS

Cahill, Carl M., Chicago, Ill.; Chicago College of Dentistry, 1902; died suddenly Dec. 30, 1924.

King, L. A., Williamsport, Ind.; Chicago Dental College, 1884; died, September 6, 1924, of acute dilatation of the heart.

McCallie, T. O., Knoxville, Tenn.; Tennessee Medical College, Dental Department, 1890; died, December 13, 1924, after a long period of ill health.

Talbot, Eugene S., Chicago, Ill.; Pennsylvania College of Dental Surgery, 1872; Rush Medical College, 1880; a member of the faculty of Northwestern University Medical School and Rush Medical College; died, December 20, 1924.

CURRENT LITERATURE

EXTRACTS AND ABSTRACTS

Cancer of the Buccal Mucosa: A small series of cases of cancer of the buccal mucosa are reported by Channing C. Simmons (Boston M. & S. J., Nov. 27, 1924). Chronic irritation was a known factor in 65 per cent of 189 cases observed in the Huntington Hospital. It is essentially a disease of men who use tobacco, and in those who chew, the lesion is commonly found on the side on which the quid is held. Pyorrhea and rough or carious teeth are universal, and ill-fitting plates not uncommon. Leukoplakia is regarded as a definite precancerous condition. Syphilis has been found in from 14 to 45 per cent of cases, but both types of lesions are often present together, and time may be lost treating the syphilitic lesion alone. The author treats the lesion as cancerous if at all suspicious. The two types found are indurated cancerous ulcer and a papillary form. The tumor tissue is sometimes mistaken for granulation tissue in cancer arising from a fold of mucous membrane around a tooth, a form of cancer often overlooked. The bone is involved early and prognosis is bad. Cancer of the tip of the tongue and floor of the mouth is most malignant, with cancer of the lower jaw and cheek following in order. Cancer of the upper jaw is usually benign. The dentist can do more to lower the death rate than can the physician because the former is usually consulted first. He should refer any suspicious lesion to a surgeon. Early recognition promises more for cure than any change in the form of treatment. Ulcer that does not heal in two weeks should be treated as cancer. Prophylaxis and removal of sources of irritation would prevent most of these cases. Surgery is the surer method of cure, but radium and roentgen ray prolong life in inoperable cases. The cases are considered in four groups: 1. Precancerous lesions. 2. Very early cases. 3. Cancer with few or no palpable glands in the neck. 4. Cancer with definite glandular metastases. 5. Inoperable cancer. 6. Recurrent cancer.

Radium Treatment in Oral Cancer: The knife has no place in the treatment of cancer within the mouth. The knife adds to the danger of recurrence, by carrying cancer cells into the tissues, and by cutting across lymphatics and blood vessels; and there is the ever present tendency to leave too much tissue behind in the attempt to achieve a good plastic result. I believe the best results can be obtained by thorough electro-coagulation of the entire involved area first, under a local or general anaesthetic, followed immediately by the insertion of radium deeply throughout the destroyed tissues. When accurately applied, the heat generated in the tissues by electro-coagulation effectually seals the lymphatics and blood vessels immediately surrounding the area of destruction. The treatment must be thorough and wide, and the dosage heavy, disregarding subsequent bone destruction and the temporary very painful reaction lasting from two to six weeks. When a considerable area of the tongue or floor of the mouth is to be destroyed, a preliminary ligation of the lingual artery should be performed.—G. C. Wilkins, in Boston M. & S. J., Nov. 27, 1924.

An Experiment in Caries Prevention: In recent work in the laboratory of the University of Michigan, reported by Russell W. Bunting, (Michigan State Dental Soc. Bull., December, 1924), in the study of causes of dental caries and its prevention, the workers have been impressed with the prevalence of acid-forming micro-organisms in every lesion of dental caries. These organisms, which belong to the B. acidophilus group, when grown on artificial mediums containing carbohydrates produce large amounts of acid capable of decalcifying a tooth in an incredibly short time. They are practically absent in mouths immune to caries. These organisms, it is indicated, must be a prime factor in the production of

caries. As it appears that many forms of caries are really overgrowths of a specific organism, as in other infective processes (Vincent's infection, acute pyorrhea), it seems reasonable to combat these forms also by prophylaxis and germicides. In early attempts to carry out such treatment, it was concluded that an antiseptic strong enough to kill the bacteria would injure the mucous membranes. Within recent years, it has been discovered that certain dyes are germicidal without being harmful to the tissues. One per cent solution of brilliant green and crystal violet has been employed as highly antagonistic to B. acidophilus. The procedure is repeated daily for four or five days until the film does not recur. In two severe cases, the deposits returned repeatedly after twenty-four to forty-eight hours until the dye treatment was used. Six months later, the mouths were still clean.

Bacteriology of Dental Caries: Sierakowski and Zajdel obtained positive cultures of Bacillus acidophilus-odontolyticus in 80 per cent of their cases of caries of the teeth.—Compt. Rend. Soc. Biol., Paris, Oct. 31, 1924; abstr. J.A.M.A.

Relation of Mouth Infection to Thyroid: Oliver T. Osborne reports two cases (Boston M. & S. J., Dec. 18, 1924), in one of which, hyperthyroidism in a man, aged 59, with palpation, dyspnea, muscle twitching, trembling edema of the ankles, nervousness, aortic murmur, with enlargement, the examination of the lungs, abdomen and urine was negative. The thyroid was large with dilated blood vessels and there was marked exophthalmos. The patient had eight infected teeth, some decayed down to the gums, and periodontoclasia. Digitalis, lime water, glycerophosphate and an antipyorrheic mouth wash were prescribed, and the patient was placed on a diet. The edema and heart rate improved, but the least exertion caused cardiac distress. In a few days, mitral systolic murmur had disappeared, and the size was diminished, but the aortic murmur was still loud. Digitalis was stopped; and the following day the infected teeth were removed at the patient's home. One large pus sac was removed. Four days later, the patient was sleeping better and had less trembling, and pulse rate and blood pressure were lower. This decrease continued and in a month the thyroid was much smaller and there was decidedly less exophthalmos. Gradual improvement continued until, within three months' time, the patient was sleeping perfectly, his weight had increased and the pulse rate had slowed, so he was able to go to work. Last July, after six and one-half years, the patient was perfectly well with the exception of a slight aortic systolic blow, and able to do heavy work, despite his 67 years. In a case of hypothyroidism, with primary anemia, in a professional man, aged 58, who was failing mentally and losing his hair, and had dry and yellow skin and poor circulation, examination revealed six pulpless teeth with infected roots. Within the three preceding years, the patient had had six infected teeth, two capped teeth and an infected root removed. The pulse rate and blood pressure were low; the thyroid was small; heart, lungs, abdomen and urine were negative. The diagnosis was mild myxedema, with borderline primary anemia, both due to infected teeth. Improvement followed thyroid extract and iodid therapy, and removal of four teeth. Six weeks later, the remaining infected teeth were removed, and the marked improvement in the blood count fully demonstrated the relation of the mouth condition to the anemia. Within two weeks, the patient was in fine condition, of good weight and improved pulse rate and blood pressure. There was a fine new growth of hair on the top of the head, which for eight years had had a large bald spot. When last seen, after more than a year, the patient stated that his health was perfect.

Cleft Palate Operations: The factors in a successful cleft palate operation are summarized by B. B. Cates (Boston M. & S. J., Dec. 18, 1924) as follows: 1. Thorough mobilization of the muco-periosteum, and velum muscles from the posterior border of the hard palate. 2. Recognition of the importance of a symmetrical fusion of homologous tissue in a common tendinous center to get the best functional results; the symmetrical fusion of homologous tissue enabling the patient to coordinate the muscles to a better advantage, as in articulation. 3. Importance of introduction of the proper suture at the proper place as making this symmetrical fusion possible, and on which it depends. 4. Distinct advantage of the gauze strips, which should be worn as long as possible, because they tire out the flaps and relieve tension on the suture line. 5. A two stage operation in case the cleft is complete, as a safer procedure, minimizing the dangers of the flaps sloughing. It is then unnecessary

to use plates. Unless the flaps are properly mobilized the sutures cut through, plates or no plates. It is unnecessary to pare the edges of the flaps and is inexcusable to make long slashes across the velum. Thorough mobilization of the flaps and the proper placing of the sutures in the flaps is the keynote in successful cleft palate work.

Anesthesia for Dental Cases: Since the patient expects to go about his ordinary routine of living after an extraction, the condition of the patient's whole system must be considered. (T. B. Vaile, in Dental Surgeon, Dec. 20, 1924). Therefore, the following facts must be given consideration: The patient should not be fatigued. He should not omit meals before the operation, but thick gruels and spiced foods are to be avoided. The time for operation is preferably about two to three and a half hours after eating. The nasal method of giving the anesthetic (nitrous oxid) is advocated. The nosepiece only is used unless the patient finds to-and-fro breathing difficult with the mouth open by the dental prop; if he changes from nasal to oral breathing during induction, or if there is need for haste. The extraction of five or six teeth, requiring not more than seven minutes, is all that should be attempted in an office. Nitrous oxid has given as good results alone as when given with oxygen. The latter is used with anemic patients. With the children under 10, 1 or 2 per cent of oxygen makes their control easier, and the facepiece is used, as the child is more easily restrained and the anesthesia is sufficiently long. Contraindications, other than respiratory obstruction, bronchitis, etc., for the use of nitrous oxid are: difficult extraction, as in unerupted wisdom or molar teeth; extensive extractions; abnormal position; and a history of resistance to gas, especially in muscular alcoholics, with large tongues filling the mouth. In these cases, local analgesia or ether or chloroform should be used. The history of the patient is never to be disregarded.

Ethylene: Ethylene was introduced as an anesthetic more than fifteen months ago and received prompt and favorable attention by the medical profession, writes Arno B. Luckhardt (J.A.M.A., Dec. 27, 1924). Favorable reports, with case histories, have been published both here and in France, and recently ethylene has been introduced in the Pekin Union Medical College, China, where it has been accepted enthusiastically. Drs. Lewis and Bevan, following successful animal experimentation, gave ethylene its first clinical tests, which confirmed its practicality as an anesthetic. It is less toxic and dangerous than any of the other anesthetics as judged by its effect during and after administration. Since ethylene oxygen in proper concentrations is highly explosive, serious accidents (from nearness of free flame, thermocautery, electric sparks or electric gas warming apparatus) are quoted to its discredit, although ether oxygen or ether nitrous-oxid oxygen mixtures are as explosive under similar conditions. The ethylene used in animal experimentation was undoubtedly purer than the product which has been manufactured since that time. In the absence of formulated standards, some gas of vile and pungent odor has been produced, whose use has been attended with cyanosis, imperfect relaxation and prolonged emesis, to the disappointment and disgust of operators. Some distributors are bending every effort to produce a gas of the greatest possible purity. It is a significant fact that had animal experimentation been denied, the analgesic and anesthetic properties of ethylene would never have been discovered.

Resuscitation During Anesthesia: Most of the catastrophes under anesthesia are preventable and prophylactic measures should be constantly enforced. The induction of ether or chloroform should, of course, he smooth and gradual. Orders to "blow it away" and to "take deep breaths" are still to be heard in anesthesia rooms, despite all that has been said against such practices. How important constantly to keep the airway open and free from mucous! How important not to permit the patient to strain and exhaust his respiratory mechanism by struggling through the operation with air passages obstructed by the position of the tongue or head! No matter what the anesthesia, we should always fear and guard against cyanosis and note not only that the patient is breathing, but that there is a sufficient amplitude of tidal air movements. The patient under local or spinal anesthesia should constantly be watched as if under ether or chloroform. The cause of any marked rise or fall in the blood pressure should immediately be ascertained. The respiration usually stops before the heart. While the air is no longer moving, the muscles of respiration may continue to

contract up to the time of cardiac arrest. With a failing circulation, the heart should not be permitted to stop, for if it does the difficulties of resuscitation are tremendously increased. If the systolic pressure falls below 40 mm., an intravenous injection should immediately be started. In the emergency, everything should be focalized upon the simple necessary essentials. But three things have to be done: First, to maintain the circulation; second, to maintain the respiration; and, third, to maintain the bodily heat.—W. W. Babcock, in Anesthesia and Analgesia, December, 1924.

Dentofacial Deformities and the Thorax: The author, D'Alise (Dental Rec., Dec. 1, 1924) deplores the fact that in artificial feeding, so common in this day, the facial muscles get neither normal nor harmonious activity. After weaning, the unfavorable conditions persist, since the child, even after twenty teeth, eight of them molars, have erupted, continues on a diet that demands little of the masticating muscles. "The results of this error reflect not only upon the teeth but on the whole organism, from general nutrition to the irregular and abnormal development of the facial bones, to the cavities and organs contained therein, and more especially to the oral cavity and nasal fossae, which will be more particularly considered." The constitutions of children of today are perhaps better in every respect except in their dental systems, and they present dentofacial deformities (prognathism, gothic arch, narrow dental arches, etc.) that were not present in their parents, or only to a minor degree. Are these conditions an expression of human evolution or do they represent phenomena of degeneracy? Supporting the second hypothesis is the fact that an imperfect dental system is always the expression of a defective organic and functional condition of the entire human organism. A defective dental system is one of the most dangerous predisposing conditions for tuberculosis, not only because, through dental caries and on account of septic conditions of the oral cavity the penetration of the tubercle bacillus is very easy, but also because a faulty dental development weakens the essential functions of animal life, which are digestion and respiration. Normal development of the limbs and trunk demands sufficient functional exercise of their active parts, the muscles; therefore, by the same biologic law, the face, where the first step in digestion takes place and the first step in respiration, demands exercise for the normal development not only of itself but, more important, of the respiratory apparatus. Dentofacial deformities, which are the result of lack of proper activity of the muscles of masticating, in turn further impair the masticatory function, and the respiratory function. Normal chest development cannot exist when the respiratory tract is obstructed or narrowed. Under such conditions, gymnastic exercises of the limbs and trunk are useless and even harmful, as they overwork the heart and organism and cannot develop the thorax and lungs normally. The author has reached these conclusions after careful examination of oral cavities of children from 3 to 15 years, inmates of a charitable institution, his conclusions having been confirmed by observation of the tuberculous and heredosyphilitic, in whom malocclusion is very frequent, always in these tests accompanied by insufficient thoracic development.

Radium and Roentgen-Ray Therapy: Ewing and other pathologists have pointed out that as a rule highly cellular tumors respond more readily than those containing much stroma, while on the other hand, certain benign tumors which are extremely fibrous in structure yield very readily to radiation, conspicuous in this class being uterine fibroid, which often melts under a single rather mild radium application. Again a fibroid which, to the examiner, may appear the exact counterpart of one that has responded with uncanny promptness may prove very resistant to radiation. It has long been known that sarcoma responds much more readily to radiation than carcinoma, while, again, tumors that show a ready response to the initial treatment may behave very badly in the end since they tend to return and become resistant to radiation, while others, as frequently occurs with mixed parotid tumors, diminish very slowly in size but under the influence of treatment tend to remain localized and perhaps become operable. Many phases of this problem, which is now, perhaps, the most important in radiation therapeutics, remain to be developed and will become clarified only through years of experience and accurate classification of lesions, coupled with accurate

and truthful reports of treatment and results.—C. D. Enfield, in Am. J. Surg., December, 1924.

Vincent's Infection in Syphilis: A case of Vincent's infection occurring in a patient under treatment for syphilis is reported by I. C. Sutton (J.A.M.A., Dec. 13, 1924). Many clinicians supplement the topical treatment of this infection with intravenous injections of arsphenamin, the value of which would seem questionable, since this patient had received a third injection before Vincent's infection became manifest. The temperature was 102.3 F. The pharyngeal mucosa was fiery red and there were a few scattered, discrete vesicles. The gums were only slightly involved, but there were many carious teeth. The vocal cords were intact, but the submaxillary lymph glands were enlarged and rather tender.

Orthodontia in General Practice: Another strong reason why orthodontia should make a strong appeal to the dentist in general practice is found in the fact that it is the most preventive branch of dentistry. Indeed, there is more preventive dentistry in orthodontia than in all other elements of dental practice. More than 50 per cent—probably more than 50 per cent—of pyorrhea is due to malocclusion, misplacement of teeth so that they either receive no stress or receive the stress of mastication not in the direction of the long axis of the tooth. If a tooth receives no stress, it is devoid of its active function, deprived of its function, and its supporting tissues deprived of the natural stimulation of its functioning, the entire organism becomes stagnant and easy prey to disease. A tooth is swung in its socket by the fibers of the periodontal membrane, which pass in every direction laterally and gingivally from the surface of the root of the tooth to the bony wall of the tooth socket and into the tough fibrous tissue which forms the gingiva. If the tooth is in normal position and in normal occlusion, it will receive the stress of mastication in the general direction of its long axis, and there is a nice balance in the stretch and resistance to stress of the opposing sets of these fibers. This is natural and has a stimulating and strengthening effect on the entire set of fibers. If a tooth receives masticating stress in a direction other than the long axis of the tooth, the nice balance of the support and resistance to stress by these fibers of the periodontal membrane is destroyed. The stress is lateral, and the fibers attaching to the side of the root against which stress comes are unduly stretched and strained, causing an oversupply of blood, which is congestion, and abnormally heating the tissues, which is inflammation, weakening the vitality and the natural resistance of these tissues to disease—an open door for infection, which is pyorrhea.—A. V. Louderback, in Bull. Chicago Dental Soc., Jan. 2, 1924.

Local Anesthesia: Under this title, C. E. Kells (Dental Cosmos, December, 1924) discusses fear, particularly of the needle, the presence of unpleasant symptoms, block anesthesia (conduction method), infiltration anesthesia, intra-osseous anesthesia, the question of needles, temperature of the solution, holding the syringe, a new syringe and the breech-loading syringe.

Preventive Dentistry: I want to enter a protest against the efforts of many dental educators and dentists who oppose all efforts to extend or make adequate the fundamental biological basis of our professional knowledge and training. We need operators, to be sure, to care for the diseased teeth of those financially able to afford modern dental work, to take the places of those who drop out and to care for the new increments of population. But more than that—far more—we need men to devote their lives to the more fundamental underlying causes of dental disease. We need men trained for research as the research men in medicine are trained. We need men trained in the fundamentals of medical science so that they are prepared, as medical graduates are prepared to meet the problems of nutrition and general pathology as well as those of psychology and sociology with which they are confronted in this work. A technical training of the past or an indefinite extension of such technical training does not do it.—H. J. Leonard, in Dental Facts, December, 1924.

Dental Therapy in Children: M. L. Cohn (Internat. J. Orthodontia, Dec., 1924) emphasizes the following points: 1. Dentistry pertains essentially to childhood and to the prenatal period. 2. Dentistry is a branch of medicine and is fundamentally related to the body in general. 3. Intensive study of the teeth of children histologically and systemically is indicated, and careful histories should be taken to complete this study. 4. Standardization of therapeutic methods in the case of children's teeth should be

inaugurated by the dental colleges and comprehensive articles published for the benefit of the practitioner. 5. Attractive hygienic propaganda should be introduced to the public from infancy to senility. 6. The ideal dentist is the man so trained that he understands the body physiologically and pathologically, and in its relationship to oral defects. He should be able to efficiently care for all conditions existing in the oral cavity, and to recognize their relationship to general disturbances.

Root Canal Problem: Heretofore, the basis of success in the treatment and filling of infected pulpless teeth has been made upon a premise of absolute bacteriological asepsis. We are fast coming to realize this is not possible and to a certain extent is incorrect. This does not mean that laxity can be condoned or that the fullest effort to secure bacteriological asepsis should not be taken in all canals and periapical areas. But it is striking to note that in culture-making, subsequent to all forms of treatment, 30 per cent of the clinically sterile cases afford positive growths. This has proved to be true in the most instances of those who are checking their cases regularly, and of those who depend on the services of a bacteriologist. It comes as a forcible comparison that during the war only 30 per cent of surgically aseptic wounds were bacteriologically aseptic, and yet, by virtue of the work of the Carrel group, the surgical skeptics were silenced by the vast evidence of limbs and lives saved in the absence of bacteriological asepsis. The dental operator must continue his efforts to secure absolute sterilization. But to the conservative general practitioner, it is satisfactory to know that he also may hope the natural resistance and tonicity of the body shall assist him in accomplishing a safe result.—E. P. R. Ryan, in Dental Magazine, December, 1924.

Essentials to Successful Full Denture Service: The five essentials are named by Russell W. Tench (Dental Digest, December, 1924) as: 1. Tolerable or physiologic extension. 2. Tolerable or physiologic adaption of dentures to areas upon which they are retained. 3. An accurate determination of the central occlusion relation. 4. A relation of the teeth in each denture to the underlying ridge that will reduce leverage to the minimum. 5. Mechanically balanced relation of each tooth to its antagonist. According to the author: "The success of denture construction does not depend alone upon correctly fulfilling the requirements of any particular case in the five basic fundamentals to be discussed. These five essentials seem to be the skeleton work to which refinements may be added, but without which any refinements are useless."

Animal Experimentation: The treatment of diabetes has been revolutionized through the discovery of insulin, and it all was brought about through animal experimentation on dogs. All of the diabetics in the United States, supposedly numbering approximately one million persons, should not only be acquainted with this fact, but every one of them should fight the antivivi-sectionists who are trying to prohibit animal experimentation.—Indiana State Dental Soc. J., November, 1924.

New Age of Dental Surgery: Dentistry of the older days was not so much a phase of medical practice as a branch of mechanics. Teeth could be filled and extracted very successfully without annoying resorts to biological concepts of the factors causing decay and other dental diseases, and without any thought of possible sequelae. This being the case, the problem of the etiology of dental disease was not attacked seriously, and indeed, remained an unsolved problem until well up into recent times. As long as dentists were content to merely fill cavities and make plates for their edentulous patients without investigating the underlying causes for pathological conditions of the oral cavity, dentistry was a skilled trade, nothing more nor less. Even today, dental operations may be carried out in a mere mechanical manner or they may be carried out in a manner worthy of being called professional. Filling teeth does not and cannot eradicate the causes of dental caries.—Wilfrid A. Bourbonnais, in Dental Student, December, 1924.

Effect of Diet on Teeth: The survey made by Brown of the condition of children's teeth confirms the theory that a coarser diet is associated with good teeth, and a softer diet with bad teeth. It confirms the idea that soft water is prejudicial and hard water beneficial to the development of good teeth. It suggests the importance of sunshine in assisting the growth of strong, healthy teeth. The use of a toothbrush is a hygienic rite which it is desirable to carry out, but Brown is convinced that it is of secondary importance in the prevention

of dental disease. What is of prime importance is the character of the diet from early infancy. This should be of much more detergent character—at any rate, at the end of a meal—so that no residue is left behind to undergo decomposition. Coarser meal for bread, crusts, zwieback, raw fruit or raw vegetable, especially of the fibrous sorts, are effective cleansing agents. In areas where the water supply is soft a greater consumption of calcium-containing foods, such as milk and cabbage, is needed. It would be advantageous probably to add chalk regularly to the diet. The use of small doses of cod-liver oil, and the greater exposure of the body surface to the sun's rays during the cooler hours of the day, would enable the body tissues to make full use of available lime in the diet.—South African M. Rec., Sept. 27, 1924; abstr. J.A.M.A.

Cancer: Here are five cancer axioms which everybody should learn by heart: 1. After the age of 35, one out of every eight women and one out of every eleven men die of cancer. 2. Cancer is at first local and permanently curable by operation. 3. Cancer nearly always gives some indication of its presence while in this stage. 4. In at least four-fifths of cases cancer begins in regions accessible to surgery. 5. The majority of cancer deaths are due to delay and are therefore unnecessary.—David Cheever, in Hygeia, January, 1925.

Comparative Diagnosis: There are 500,000 children in the primary grades of Cook County with an average of five carious teeth to the child. The total number of teeth needing attention is 2,500,000. In order that we may have a proper appreciation of the magnitude of the problem and the work entailed in caring for this number of carious teeth, let us compare it with what was accomplished by five dentists working all their time for one year at the Honolulu Dental Infirmary. They filled 21,892 teeth and extracted 8,091—a total in round numbers of 30,000 carious teeth. Assuming that the same ratio of teeth that can be filled and those which required extraction existed here in the mouths of school children of Cook County, then we find that by dividing 2,500,000 by 30,000 we have a quotient of 80. That means, it would take 400 men full time to take care of the immediate problem. One who is in a clinic where many children are being examined realizes the tremendous need of something adequate in the way of treatment. The mere examining of the child's mouth and tabulating the number of carious teeth accomplishes nothing of value so far as the child is concerned.—J. E. Schaefer, in Dental Forum, December, 1924.

Dental Diagnosis: The general public has been thoroughly awakened to the importance of oral sepsis and its influence on general health. Patients cannot be expected to tolerate the sacrifice of teeth which function satisfactorily and manifest no subjective symptoms on general principles, or the doubtful chance of a possible improvement of the systemic disturbances. The public realizes the masticatory value of teeth, and rightly expects the benefits of an exhaustive examination before subjecting itself to any radical form of treatment. When we compare the elaborate diagnostic methods of the medical profession with the cursory examination on which a dental diagnosis is not uncommonly made, it is little wonder that our medical confréres feel a self-righteous sense of professional superiority. For this, we are in no small measure responsible.—J. V. Hall Best, in Dental Sc. J., Australia, December 1, 1924.

Pain in Area of Fifth Nerve: Unusual forms of pain in the area of the fifth nerve are described by H. L. Parker (J.A.M.A., Nov. 22, 1924), who presents eight illustrative cases as follows: Case 1: Migraine attacks with pain in the upper jaw during the course of severe periodic headaches. Physical examination revealed no definite lesion, and search for pathologic conditions in the nose, sinuses, teeth and cranium were uniformly negative. Cocainization of the nasal mucous membrane during an attack gave no relief. Case 2: Migraine attacks characterized by general headache or localized pain in an area of the second division of the fifth nerve. Constant pain following exhaustion. No manifest disease was found around the upper jaws or teeth, and cocainization of the nasal mucous membrane has no influence on the pain. Case 3: Neuralgic migraine unrelieved by multiple sinus operations and section of the posterior root of the fifth nerve. There was complete cessation of function in the right fifth nerve, with abolition of sensation and motor power. Case 4: Somatic delusions of senility. Operation gave no relief, but rather increased the symptoms complained of. Case 5: Pain arising from an emotional episode. A quarrel with

her husband after extraction of teeth under nitrous oxid, followed by remorse and a too sympathetic interest in her alleged sufferings, resulted in this patient's complaining of an ever-present sensation of fulness in the lower lip. Case 6: Hysterical pain in the right cheek. The patient was free from pain only when free from work and responsibility. Case 7: Multiple operations on the right side of the face, two intracranial operations on the fifth nerve and persistence of symptoms. Case 8: Paroxysmal pain of thirteen years' duration, with intervals of normal health, and without obvious cause. "The patient was a rather likable well-balanced girl, with no neurotic tendencies, not unduly hypersensitive, without any family history of migraine, and we could not help feeling that we were witnessing a very definite syndrome. The sphenopalatine ganglion was thoroughly cocainized during a few attacks, but without relief, and twelve deep alcohol injections had also been given elsewhere into the fifth nerve, also without relief." The author concludes: "While this is only one of many of the unsolved problems of this type, it is to be hoped that continued observation, research and patient study in the future may ultimately lead to the understanding of all the multiple possibilities coming under the category of pain in the area of the fifth nerve."

Alcoholic Injections into the Gasserian Ganglion: Eleven cases are reported by G. M. Dorrance (J.A.M.A., Nov. 22, 1924), with the following conclusions: Injections of the gasserian ganglion are usually permanent, if enough alcohol is injected. At times, one is able to inject the lower one-third or half of the ganglion and not involve the entire ganglion, but no one can promise this. Paralysis of the ocular muscles occurs at times. It always clears up. The absolute indication for injecting the ganglion is in carcinoma of the upper or lower jaw, or one side of the tongue. In outside injection as well as ganglionic injection, the prognosis can be made at the end of the month; i. e., if anesthesia is present at the end of a month, it is apt to remain so. The results depend on just how much alcohol is distributed in the ganglion or posterior root, and, in the case of an outside injection, into the nerve fibers. Eye complications occur in about the same proportion as in division of the root by any other method. The author has had no mortality.

Procain Dermatitis: We see occasionally a case of novocain (procain) dermatitis on the hands of dentists, although it is not common. It is very difficult to desensitize people who have this proclivity. I have tried to desensitize dentists by small doses of novocain, without success. It is necessary for susceptible individuals to avoid the drug. Novocain dermatitis begins with itching and an erythema, usually on the dorsums of the fingers or on the webs. Soon little vesicles appear, and later crusts. The eruption may spread to the face, or even become generalized. Roentgen-ray treatment and soothing lotions are the best form of treatment.—G. C. Andrews, in Oral Health, December, 1924.

Heart Disease: Cleaner mouths, fewer diseased tonsils, fewer neglected decayed teeth, earlier recognition of sore throats, and quick care in their treatment as serious infections, the considered and skilled attention to the little child with aching muscles and joints—"too young to have rheumatism," kept up and about with "growing pains"—repeated examination of the heart after attacks of any acute infectious fever in childhood; always separation of the sick from the well; by such means will the number of acute rheumatic hearts be reduced.—Haven Emerson, Survey Graphic, November, 1924.

Contribution of Dentistry to Medicine: It is true that we have gained largely by our better realization of the surgical and medical side of our profession, but we have still much to gain, and we have lost not a little. The millennium of caries-free teeth is not yet, and a large portion of a dentist's work still consists of the filling of teeth and the making of artificial dentures. Nothing has yet been discovered to replace with complete effect the hammered gold filling in front teeth. Fused porcelain and gold inlays may perhaps claim to do so, but synthetics are not to be compared with gold for durability, and as soon as they are washed, the contact points, even if they existed, are gone. I think there is a real danger that in our zeal for surgical cleanliness we may lose our old operative skill. The pendulum has been describing large curves, but we may hope that it will take up a final position neither to right or to left, but between the extremes in the center of its path.—A. E. Rowlett, in Brit. Dental J., Dec. 1, 1924.

Announcements

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

Alumni Association of the University of Buffalo School of Dentistry, February 26-28, 1925, Buffalo, New York.

American Association of Dental Schools, March 19-21, 1925, Chicago, Illinois.

American Dental Association, September 21, 22, 23, 24, 25, 1925, Louisville, Kentucky.

American Dental Society of Europe, July 28-31, London.

American Medical Association, May 25-29, 1925, Atlantic City, New Jersey.

American Society of Orthodontists, April 14-17, 1925, Atlanta, Georgia.

Fédération Dentaire Internationale, August 5-7, 1925, Geneva, Switzerland.

Marquette University Dental Alumni Association, February 18-20, 1925, Milwaukee, Wisconsin.

New York Society of Orthodontists, March 11, 1925, New York City.

Pacific Coast Dental Conference, 1926, Portland, Oregon.

Philadelphia Dental College Alumni, April 15, 1925, Philadelphia, Pennsylvania.

Seventh International Dental Congress, August 23, 24, 25, 26, 27, 1926, Philadelphia, Pennsylvania.

Southwestern Society of Orthodontists, April 8-11, 1925, Tulsa, Oklahoma.

University of Iowa College of Dentistry and Alumni Clinic, February 26-27, 1925, Iowa City, Iowa.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June inclusive.

National Capital at Washington, D. C., first Tuesday of every month.

February (1925)

Minnesota, at Kenwood Armory, Minneapolis (10-13).

March (1925)

Washington (18-21).

April (1925)

Alabama, at Mobile (8).
Connecticut, at Hartford (April 30-May 2).
Kansas, at Hutchinson (20-22).
Michigan, at Grand Rapids (6-8).
New Jersey, at Newark (8-11).
Oklahoma, at Oklahoma City.
Virginia, at Staunton (27-29).

May (1925)

Arkansas, at Little Rock (25-27).
Illinois, at Peoria (12-14).
Indiana, at Indianapolis (18-21).
Iowa, at Des Moines (5-7).
Maryland, at Baltimore (4-6).
Massachusetts, at Boston (4-8).
Missouri, at Kansas City (11-13).
Nebraska, at Omaha (third week).
New York, at Albany (13-15).
North Carolina, at Pinehurst (12-14).
North Dakota, at Fargo (5-7).
Pennsylvania, at Reading (5-7).
Tennessee, at Knoxville (5-7).
West Virginia, at Beckley (18-20).

June (1925)

Colorado, at Colorado Springs (18-20).
Maine, at Bangor (24-26).
New Mexico, at Albuquerque (20).
South Dakota, at Watertown.
Southern California, at Los Angeles (29-30 July 1-2).
Utah, at Salt Lake City.
Washington, at Spokane (1).

July (1925)

Rhode Island, at Newport.
Wisconsin, at Madison (14-16).

September (1925)

Kentucky, at Louisville (18-19).

MEETINGS OF THE STATE BOARD OF DENTAL EXAMINERS

Kansas at Wichita, June 15, 1925. Secretary, George E. Burket, Kingman, Kansas.

Massachusetts, at Boston, March 9-12, 1925. Secretary, J. N. Carriere.

KENTUCKY STATE DENTAL ASSOCIATION

The next annual meeting of the Kentucky State Dental Association has been changed to next September 18-19, 1925, in a business session rather than a regular program on April 6-8, as previously announced.

W. M. RANDALL, *Secretary*,
1035 Second Street,
Louisville.

THE SOUTHERN CALIFORNIA DENTAL ASSOCIATION

The Southern California Dental Association will meet in Los Angeles, June 29-30 and July 1-2.

J. WALTER GRAY, *Secretary*,
Union Bank Bldg.,
Los Angeles.

NORTH DAKOTA STATE DENTAL ASSOCIATION

The next annual meeting of the North Dakota State Dental Association will be held at Fargo, May 5-7, 1925.

L. R. MCLAIN, *President*,
Jamestown.
F. B. PEIK, *Secretary*,
Carrington.

TENNESSEE STATE DENTAL ASSOCIATION

The fifty-eighth annual meeting of the Tennessee State Dental Association will be held in Knoxville, May 5-7, 1925.

J. B. JONES, *Secretary-Treasurer*,
Murfreesboro.
H. H. NAFF, *President*,
Knoxville.

WISCONSIN STATE DENTAL SOCIETY

The next annual meeting of the Wisconsin State Dental Society will be held at Madison, July 14-16, 1925.

R. W. HUEGEL, *Secretary*,
104 King Street,
Madison.

DENTAL SOCIETY OF THE STATE OF NEW YORK

The Dental Society of the State of New York will hold the fifty-seventh annual meeting at the Hotel Ten Eyck, Albany, N. Y., May 13, 14, 15, 1925. All literary exercises, clinics and exhibits will be staged at the Hotel Ten Eyck. The Society extends a cordial welcome to all ethical dentists. Reservations should be made early at the Hotel Ten Eyck.

Exhibitors are requested to address Dr. E. W. Briggs, 1116 Madison Avenue, Albany, N. Y., for space.

A. P. BURKHART, *Secretary*,
57 East Genesee Street,
Auburn, N. Y.

KANSAS STATE BOARD OF DENTAL EXAMINERS

The Kansas State Board of Dental Examiners will hold their next examination the week beginning June 15, 1925, at Wichita, Kansas.

GEORGE E. BURKET, *Secretary*.
Kingman, Kan.

UNIVERSITY OF IOWA COLLEGE OF DENTISTRY

The College of Dentistry and Alumni Clinic will be held Feb. 26-27, 1925, at Iowa City. There will be a general clinical program by selected clinicians and three lectures by Weston A. Price, Cleveland, Ohio. Hotel reservations should be made now.

RAY V. SMITH, *Secretary*,
J. F. SCHOEN, *President*.

THE NEW YORK SOCIETY OF ORTHODONTISTS

The annual meeting of the New York Society of Orthodontists will be held on Wednesday afternoon and evening, March 11, at the Hotel Vanderbilt, Park Avenue and Thirty-Fourth Street, New York City.

WILLIAM C. FISHER, *Secretary*,
501 Fifth Ave., New York City.

SOUTHWESTERN SOCIETY OF ORTHODONTISTS

The Southwestern Society of Orthodontists will meet in Tulsa, Okla., April 8-11, 1925. A good program has been arranged and a full attendance has been promised.

P. G. SPENCER, *Secretary*,
510 Amicable Bldg.,
Waco, Texas.

GOLDEN ANNIVERSARY DINNER TO DR. AINSWORTH

A golden anniversary dinner, as a testimonial to Dr. George C. Ainsworth, commemorating his fifty years of active service in the dental profession, will be held at the Hotel Somerset, Boston, Thursday evening, Feb. 26, 1925. A reception will be held at 6 o'clock and dinner will be served at 7.

FRANK A. DELABARRE, *Chairman*,
520 Beacon Street, Boston.

CHANGE OF ADDRESS

Readers of THE JOURNAL should notify us promptly of change of address. Scarcely a month goes by that we do not receive numerous complaints concerning failure to receive THE JOURNAL when, as a matter of fact, a change of address has been made and no notification concerning it sent to us. Dentists who reside in the city and change from one office building to another are the worst offenders, largely for the reason that they believe that they are sufficiently well known that their mail will follow them anyway, though such is not the case, as the post office makes no attempt to follow up changes of address when delivering second class mail. Notification of change of address will receive our prompt attention, and on request, as far as possible, we will supply duplicates to take the place of those copies of THE JOURNAL that go astray in the mail.

DEATH OF JACK WILLIAMS

The Williams Gold Refining Company announces the death of Jack Williams, vice-president and general manager, which occurred January 8, of pneumonia.

PATENTS OF INTEREST TO DENTISTS.

1400346. Mercury vapor lamp, Marie J. Cornu, Paris, France.

140044. Dental casting machine, Joseph H. French, Peterboro, Canada.

1400001. X-ray tube, Thomas B. Rider, Los Angeles, Calif.

1400333. Fluoroscopic X-ray system, Harry F. Waite, New York, N. Y.

1399834. Aperture cleaning syringe, Stanislaw Wilinski, Bay City, Michigan.

59952. Design, Nozzle for syringes, Henry J. Bruen, East Orange, N. J.

59965. Design, Receptacle for dentists' use, Spencer M. Hurtt, Ridley Park, Pa.

1400653. Forceps, Robert Barbour, Paterson, N. J.

1400854. Dental lip and tongue depressor, Arthur Barr, San Rafael, Calif.

1400607. Guard for X-ray tubes, George C. Johnston, Pittsburgh, Pa., and L. S. Uphoff, Schenectady, N. Y.

1400613. False tooth and supporting means therefor, Nicholas R. Lourie, Gloucester, Mass.

60059. Design Standard for X-ray apparatus, Oscar H. and A. F. Pieper, Rochester, N. Y.

1401243. Artificial denture, Frank L. Eager, Waterbury, Conn.

1401793. Heating device, Karl W. Knapp, Des Moines, Iowa, and W. G. Holmes, Minneapolis, Minn.

1401190. Mouth prop, Sheridan Risley, Cleveland, Ohio.

1401646. Saliva ejector for use in dental treatment and the like, Jans Aaberg Ronn, Kolding, Jutland, Den.

1401933. Dental vulcanizer, Henry L. Wygert, Albany, N. Y.

160104. Design, X-ray apparatus, O. H. and A. F. Pieper, Rochester, N. Y.

1408429. Sterilizer, James A. Anderson, Morgan and J. L. Anderson, Salt Lake City, Utah.

1408989. X-ray apparatus, Wm. D. Coolidge, Schenectady, N. Y.

1408582. Appliance for retaining artificial dentures or artificial teeth in place, Charles W. Gillespie, Marion, Indiana.

1408889. Dental device, John H. Kellog, Battle Creek, Michigan.

1408520. Dental instrument, Otto H. Larsen, Chicago, Ill.

1408907. Dental engine handpiece, Will R. Porter, Prince Bay, N. Y.

1408333. Mold for artificial teeth, Percy J. Pullem, Philadelphia, Pa.

1408777. X-ray angle indicator, Howard R Raper, Albuquerque, N. Mex.

1403773. X-ray angle indicator, Howard R. Raper, Albuquerque, N. Mex.

1408960. Dental cement, Sally Schiff, Karlsruhe, Germany.

1409038. Taking dental impressions, Clinton H. Stubbins, Aspinwall, Pa.

1408559. Panoramic X-ray apparatus, Alvin F. Zulauf, Brooklyn, N. Y.

1409830. Toothbrush, George Chicken, Lodi, N. J.

1409439. X-ray machine, Charles Fayer, New York, N. Y.

1409701. Toothbrush holder, Harvey Giles, Brooklyn, N. Y.

1409226. Blowpipe, Wm. J. Leighty, Chicago, and I. Allen, Downers Grove, Ill.

Copies of the above listed patents may be obtained for 25 cents each, by addressing John A. Saul, Solicitor of Patents, Fendall Building, Washington, D. C.

The Old Mossback That Pulls Back

By Ernest V. Madison

ON THEIR little island, near Japan, the Ainu women tattoo the form of a mustache on the upper lip. They believe it makes them beautiful. It is *tradition,* coming from centuries back that influences these women to disfigure their faces with "smut-tattoo" marks.

Tradition operates through the workings of the human brain. Always it opposes progress. Fulton and his steamboat were booed and ridiculed. The Wright brothers were deemed eccentric, but harmless. Many of our grandfolks refused for years to ride on railroad trains. They believed it would be impossible to breathe while traveling at a speed of thirty miles an hour.

Tradition is an old mossback that hides back of the years and pulls back to keep folks from going ahead—to keep them from improving standards and methods of living, of health keeping and of business.

Advertising is one of the antidotes against tradition. It neutralizes the acids of opposition, and removes the cobwebs of prejudice. It prepares the way for improvement. For this reason, the habit of reading advertisements is profitable to one's self.

In *The Journal of the American Dental Association,* for instance, the leading manufacturers of dental supplies and equipment come to us to talk about their products.

The reading of these advertisements will educate us and keep us in touch with the trend of practical progress in our field.

CLARENCE J. GRIEVES, M.A., D.D.S., F.A.C.D., Baltimore, Maryland
Recipient of the Callahan Award, 1924